DOCUMENT RESUME

ED 248 646 EC 170 424

AUTHOR Areson, Ann H., Ed.; DeCaro, James J., Ed.
TITLE Teaching, Learning and Development: Volume I.
INSTITUTION Rochester Inst. of Technology, NY. National Technical Inst. for the Deaf.
SPONS AGENCY Department of Education, Washington, DC.
PUB DATE Jun 84
NOTE 494p.; For individual papers in Volume 1, see ED 209 907, and EC 170 425-432. For Volume II and selected individual papers, see EC 170 433-436.
PUB TYPE Collected Works - General (020) -- Reports - Descriptive (141) -- Guides - Non-Classroom Use (055)

EDRS PRICE MF02/PC20 Plus Postage.
DESCRIPTORS Career Choice; *Career Development; College Students; *Curriculum Development; *Deafness; Models; *Moral Development; Postsecondary Education; Problem Solving; Student Motivation; Theories; Transfer of Training

ABSTRACT

Eight papers are presented in this document, the first of two volumes of papers commissioned for the Foundations development project. The project was designed to examine curricular modifications for deaf students entering the National Technical Institute for the Deaf and to examine career development (personal, social, and intellectual development) needs of postsecondary deaf students. Five statements were formulated regarding student characteristics associated with career development problems. The statements focused on the following areas: preconceptions of careers and majors, limited self knowledge, use of unsophisticated decision making processes, lack of coping skills, and an inadequate knowledge base regarding cultures. Fourteen topics which appeared to encompass the problem areas and general statements were identified and papers were commissioned on each topic. An introductory paper offers a conceptual framework for the Foundations project, focusing on the interaction among the student, the teacher, and the curriculum. The remaining papers in the volume center on the development of the learner and the learner's processing of experiences and situations; they include: "Theories and Models of Human Development: Their Implications for the Education of the Deaf" (I. Athey); "The Role of Deafness and Education in the Moral Development of Hearing-Impaired Children and Adolescents" (M. Belenky); "Locus of Control: Review and Implications for Instruction of the Hearing-Impaired Children and Adolescents" (F. Dowaliby and J. Pegano); "Research on Motivation in Educational Settings: Implications for Hearing-Impaired Students" (M. Stinson); "Discovery versus Expository Instructional Strategies and Their Implications for Instruction of Hearing-Impaired Post-Secondary Students" (R. Blake); "Problem Solving and Decision Making: A Review of the Literature" (M. Steve); and "Transfer of Learning from One Setting to Another" (D. Dansereau and L. Brooks). (CL)

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)

☑ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

- Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

ED248646

TEACHING, LEARNING AND DEVELOPMENT:

Volume I

edited by: Ann H. Areson & James J. DeCaro

EC170424

"PERMISSION TO REPRODUCE THIS
MATERIAL HAS BEEN GRANTED BY
Ann Areson

TO THE EDUCATIONAL RESOURCES
INFORMATION CENTER (ERIC)."

The papers in these volumes were developed in 1980 and 1981 through an agreement between the Rochester Institute of Technology and the U.S. Department of Education as part of the Foundations Development Project at the National Technical Institute for the Deaf.

TABLE OF CONTENTS

VOLUME I

TABLE OF CONTENTS i

PREFACE iii

INTRODUCTION: A CONCEPTUAL FRAMEWORK FOR FOUNDATIONS, Ann H. Areson and James J. DeCaro 1

SECTION

I. DEVELOPMENT OF THE LEARNER

Chapter

Theories and Models of Human Development: Their Implications for the Education of the Deaf, Irene Athey 59

The Role of Deafness and Education in the Moral Development of Hearing-Impaired Children and Adolescents, Mary Field Belenky 155

Locus of Control: Review and Implications for Instruction of the Hearing-Impaired, Fred J. Dowaliby and JoAnne Pegano 185

Research on Motivation in Educational Settings: Implications for Hearing-Impaired Students, Michael Stinson 225

II. LEARNING AS A PROCESS

Discovery Versus Expository Instructional Strategies and Their Implications for Instruction of Hearing-Impaired Post-Secondary Students, Rowland S. Blake 267

Problem Solving and Decision Making: A Review of the Literature, Michael Steve 317

Transfer of Learning from One Setting to Another, Donald Dansereau and Larry W. Brooks 371

APPENDICES

A. TABLE OF CONTENTS: VOLUME II 495

B. ABOUT THE AUTHORS: VOLUME I 499

PREFACE

In 1979, after ten years of operation, the National Technical Institute for the Deaf (NTID), reviewed its experience in preparing post-secondary deaf students for living and working in a complex technological society. NTID concluded that, in spite of a remarkable record of achievement in educating deaf students and placing them in jobs, there was more work to be done with students who were entering the Institute, particularly in terms of finding more effective ways to promote their personal, social and intellectual development, normally referred to at NTID as "career development". This was substantiated in various reports produced at NTID over the course of its history. According to DeCaro and Areson (1982),

> For example, in 1977 (Areson), 55% of the students choosing majors at NTID were judged by faculty and staff, with whom they worked, as not prepared to make sound career decisions. White (1978) reported that 60% of the students who exited the NTID Summer Vestibule Program were unprepared to make career choices in the form of selecting a major. DiLorenzo and Welsh (1981) report that 31% of all students admitted to NTID from 1968 to 1979 changed their majors at least once. Of those students who changed majors, 52% changed to totally new career areas. DiLorenzo concluded that "...many students upon entering NTID are not ready to make a career choice..." in the form of selecting a major. (pp. 4-5)

A curriculum development team was charged with the task of formulating a curriculum proposal aimed at better meeting the developmental needs of entering deaf students. This curriculum project was known as the "Foundations" development project. After gathering and analyzing data from more than 150 faculty regarding problems common to new students, five general statements regarding student characteristics associated with career development problems were developed. These were:

1. students appear to have a limited knowledge base and frequently have erroneous preconceived notions regarding careers and majors;

2. students appear to have a limited knowledge of self (e.g. strengths and weaknesses regarding career clusters, value systems, interests);

3. students appear to use unsophisticated processes for decision-making;

4. students appear to lack a repertoire of coping skills;

5. students appear to possess an inadequate knowledge base regarding cultures. (DeCaro and Areson, 1982, p.5)

Fourteen topics which appeared to encompass the problem areas and general statements were identified. Papers were commissioned on each topic. They were comprised of a review of the literature and the implications of the literature for NTID's curricular programming and the education of deaf students.

Each paper was critiqued by NTID faculty and staff. A full day was devoted to formal presentations and informal discussions of each topic. At the end of a year of study and discussion with faculty, the development team presented a conceptual framework for developing new curriculum and/or revising extant curriculum.

The conceptual framework is the introduction to each volume. The framework focused upon the interaction among the student, the teacher and the particular content area being studied. Great importance was placed on students' actively reflecting upon the learning process and on their past and present experiences. Emphasis was placed on meaningful interaction with peers and adults during the reflection process to facilitate the interpretation of the experiences and the accurate ascription of cause and effect regarding the experiences.

While the "Foundations" development project was undertaken to address the career development needs of a specific population, subsequent interactions with other populations and programs persuaded the editors that the ideas in these papers can make a positive contribution to the development of many students. Thus, they are made available for others to review, ponder and use.

The particular blend of concepts or strategies may differ with various settings or populations. The professionals who are responsible for curriculum and student development in those settings are in the best position to apply their judgement, creativity and experience to the raw ingredients presented here.

All the papers commissioned for the "Foundations" development project are included in two volumes. Volume I centers on the development of the learner and the learner's processing of experiences and situations. Volume II is devoted to the instructional component of learning and to two concepts which have broad-based implications for an approach to teaching, learning and development.

A.Areson-15
6/6/83:jm

INTRODUCTION:

A CONCEPTUAL FRAMEWORK FOR FOUNDATIONS

Ann H. Areson

James J. DeCaro

Abstract

This paper suggests four major processes that should be addressed by "Foundations" experiences in order to better prepare students to select and enter a major:

1. Decision-making;

2. Reflecting upon the past and projecting into the future; applying this process to understanding current experience;

3. Effective studying and demonstrating a given level of competency vis a vis certain skills and knowledge areas;

4. Coping with conflicts inherent in the transition from the pre-college environment to the college environment.

Simply stated, it is recommended that all "Foundations" experiences focus upon the development of student capability to perform the four major processes.

Specifically, it is suggested that "Foundations" be designed using the following principles:

1. a learner-centered curriculum, maintaining a degree of content and instructor orientation;

2. a high degree of interaction with faculty and peers;

3. a set of rigorous institutional expectations, explicitly stated;

4. a curriculum and support system planned to optimize a student's experiencing success provided that expectations are fulfilled;

5. efforts to enhance cognitive, affective and psychomotor development will begin at the concrete experiential level and move toward abstraction and generalization.

This document will furnish the rationale for the processes and principles listed above and will provide a historical perspective on the "Foundations" development project. The paper is intended to be the conceptual framework for "Foundations" experiences.

Antecedents To The "Foundations" Concept

The "Foundations" concept and development project are the culmination of a series of studies and resulting reports, dating from 1976, which pertain to the early stages of students' career development at NTID. The following sections provide a historical perspective to "Foundations".

Report of the 1976 Study Group

In 1976, the Associate Dean for Career Development Programs (CDP) charged a group of faculty representing the various divisions of CDP with making recommendations relative to the early stages of career development of NTID students. The group was constituted as a result of the Institute's recognizing that problems existed with respect to student progress in these early stages. In 1977 the study group issued a report (Areson et al., 1977) that pointed out:

1. students' apparent inadequacies in English, math and career decision making competencies, and

2. the need for students to demonstrate certain levels of competency in personal/social skills in order to succeed in a major.

In addition, the report indicated that institutional programmatic responses to such problems were inadequate. Further, it was indicated that there was "...broad support for some form of preparatory program" (p. 3) that would:

1. allow students more time and more data on which to base a career decision;
2. allow for more interaction with students and a more thorough assessment of students' abilities by faculty and staff;
3. allow more time for appropriate skill building. (p. 11)

It was further noted that "there was strong support among those interviewed for most of the activities and goals of SVP (Summer Vestibule Program), but general discontent with the brief time allowed for these activities" (pp. 11, 12). It was felt that, "SVP could be made into a more effective and useful program by allotting more time to those activities which have a direct relationship to the process of entering a major and postponing activities whose nature is not vital to the career decision" (p. 12).

1977 SVP Evaluation

Consequently, an evaluation of the 1977 Summer Vestibule Program was conducted to identify those aspects of SVP which should be allotted more time and those aspects which could be postponed. Additionally, the objectives and overall organizational configuration of the program were reviewed. A SVP evaluation report was issued in 1978 (White, 1978) and among the recommendations contained in the evaluation report were the following:

1. The top priority of NTID should be to formulate a comprehensive plan of how to improve students' career decision making capabilities such that most students are able to make reasonably sound career decisions at the time they enter a major.
2. Objectives for SVP should be defined and priorities established from an institutional perspective (emphasis added).
3. Measures should be taken to reduce students' feelings of excessive pressure to select a major before the beginning of the Fall Quarter. This implied not only a change in attitude about the summer but also the creation of more realistic options for more students during Fall quarter.
4. The format of information sent to students prior to SVP should be reevaluated.
5. Greater continuity in faculty/student interaction should be developed in an effort to foster more trusting relationships between the two (pp. 5,6,9,36).

The Early Stages of Career Development Concept Paper (1979)

As a result of the above studies and their findings, the CDP Associate Dean, Assistant Deans and Directors concluded that "some midcourse adjustments were needed in our career development programs" (Bishop et al., 1979, p. 2). Data were collected to better define student needs and the inadequate programmatic responses referred to in the 1976 Study Group Report. The analyses of these data resulted in the delineation of five major needs:

1. better preparing students to select a major;
2. better preparing students to enter a major;
3. facilitating students changing majors within their first two years without incurring significant costs to the student or the institution;
4. reducing the time some students are taking to complete a degree;
5. reducing the rate of withdrawals for what might be considered the wrong reasons. (p. 27)

The Concept Paper included a proposal for a Foundations Program with specific content components, i.e., life skills, general education, communication and survey of technology. The concept of a "program" was proposed not so much as a prescription but rather with the intention that it would "serve as the basis for dialogue and studies from which would emerge an appropriate solution for meeting these needs" (p. 17).

Foundations Development Project

In the summer of 1979, "Foundations" development was initiated and a two person development team was charged with three goals:

1. to better prepare students to select a major;
2. to better prepare students to enter a major;
3. to facilitate changes of major without undue cost to the student or the institute.

Articulating a development process was the first task undertaken. The development process was designed to provide for collegial debate and contribution. Further, the process focused upon defining the needs, gathering/analyzing data, constructing a theoretical framework and positing solutions.

Kaufman (1972) suggests that needs identification is an analysis of the discrepancy between where one is and where one wishes to be. Such an analysis specifies the distance between these two. He further suggests that an assessment must have at least three critical characteristics:

1. the data must be as valid and representative as possible of the actual world of the learner
2. no analysis is ever final or complete
3. discrepancies should be identified in terms of ends, i.e., actual products or behaviors, and not in terms of processes (p. 29)

Following Kaufman's construct, the development process has attempted to focus, in part, upon determining the nature and magnitude of the discrepancy or distance between:

1. environmental expectations/assumptions, and entering students' characteristics;

2. the requisite processes underlying success in college, and student facility with such processes;

3. technical, general education, and communication content expectations for selecting and entering majors, and the skill and knowledge levels of entering students.

Environmental expectations. A student's experience at NTID is influenced to a large extent by the RIT/NTID environment and by the student's ability to cope with and respond to the stresses, expectations and assumptions inherent in that environment. In the course of developing "Foundations" experiences, an essential task was the analysis of the environmental dynamics influencing students. A major thrust of "Foundations" development has been, therefore, the identification and documentation of those inherent environmental assumptions and expectations. Environmental expectations are being documented through an analysis of: expected community living behaviors, Institute rules and procedures, institutional expectations regarding toleration of individual differences and respect for the rights of others, and institutional expectations regarding the maintenance of social order. In addition, the way in which NTID and RIT are organized to deliver instruction and to interact with students is being examined to determine implicit assumptions about the student. For example, at NTID Mathematics instruction is generally delivered through a learning center and it is assumed that students can schedule their own time to work on the course and will take the initiative for seeking assistance.

Learners' entry characteristics. NTID was established to serve a special population. The admissions criteria, as specified by the Guidelines, describe the target population as follows:

1. Special Help
   A student should have attended a school or class for deaf students and/or have needed special help because of being deaf.

2. Hearing Loss
   Students must have a hearing loss that seriously limits their chance of success in college without special support services. There is a general agreement that an average hearing loss of 60 decibels (ASA) or 70 decibels (KSO) or greater across the 500; 1,000; and 2,000 Hz range (unaided) in the better ear is a major handicap to education.

3. Educational background
   A student's educational background should show that he or she can probably succeed in a program of study at NTID or one of the other nine colleges of RIT. Students who are admitted should have an overall eighth grade achievement level or above. This means that the average score on an achievement test that includes reading, math and language should be at an eighth grade level.

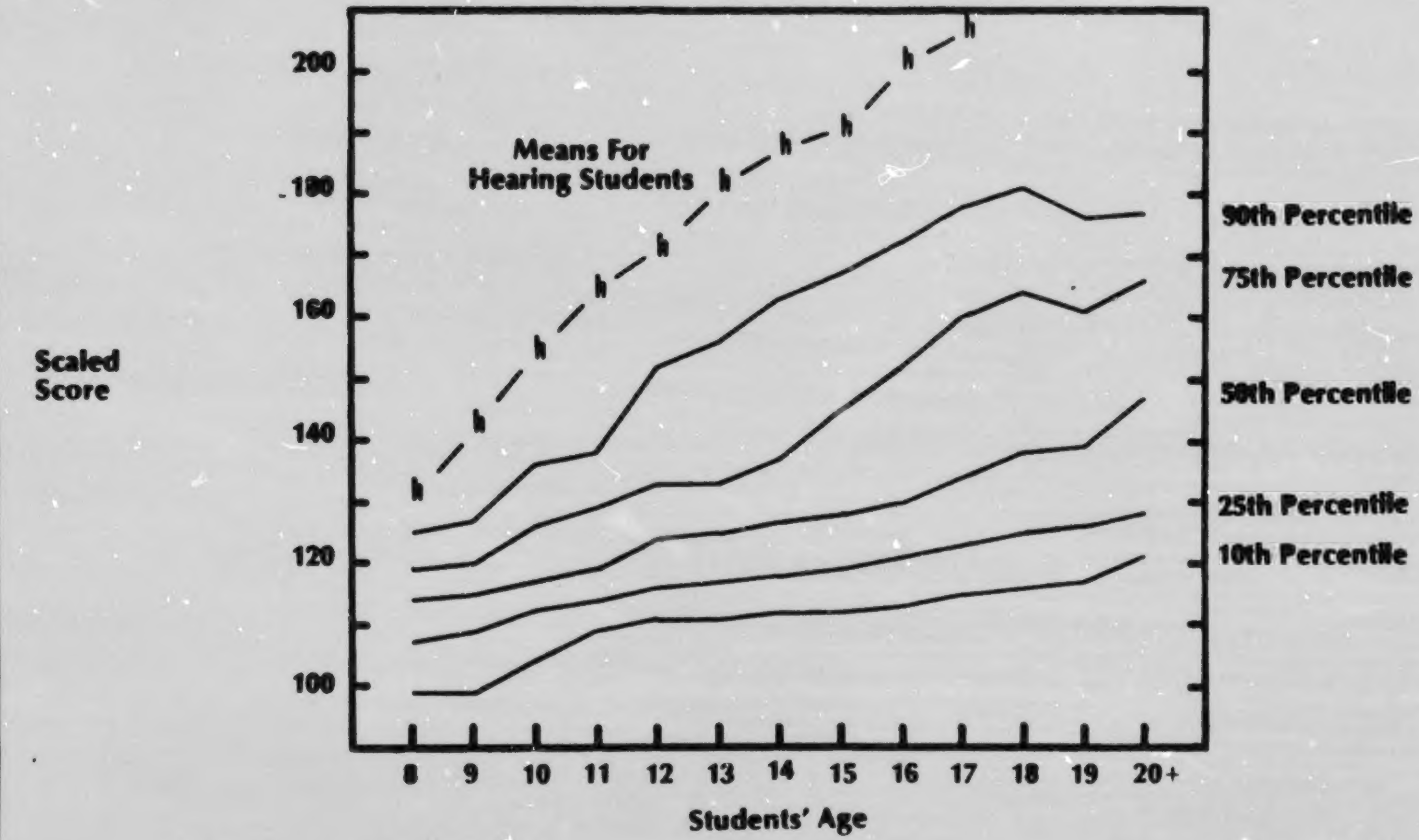
4. Secondary schooling
   The NTID program at RIT is designed for students who have finished a secondary educational program. Students can be considered for admission before completing a secondary program if their secondary school authorities feel that they will gain more from the NTID program than by remaining in secondary school. Age and personal/social maturity are given special consideration.

5. Maturity
   A student must show that he or she is personally and socially mature enough to enter a program at NTID or one of the other nine colleges at RIT. This means that students must accept responsibility for themselves and their actions and respect the rights of others. The information is provided through the student's personal references and performance in the Summer Vestibule Program (SVP).

6. Citizenship
   A student must be a citizen or permanent resident of the United States. (RIT Official Bulletin, 1980, p. 14)

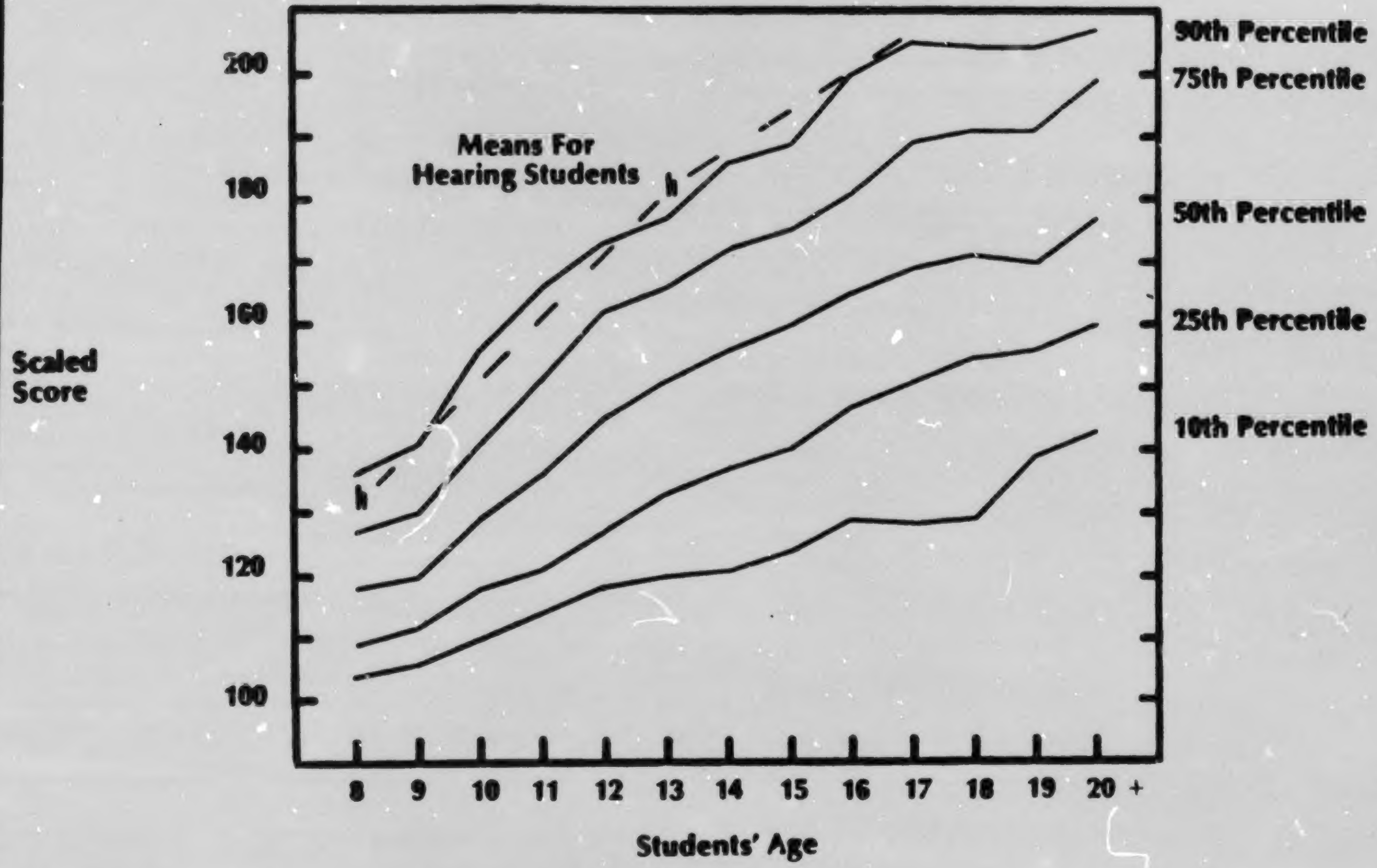
These admissions criteria have not changed since their establishment, i.e., NTID still strives to serve the same population its founders intended. An examination of some key characteristics of entering students over the past six years (see Appendix, see also Figures 1 and 2) shows these characteristics to be essentially unchanged. Not only has the nature of the entry population remained stable, but this population continues to represent the top 10% of the hearing-impaired secondary school graduates in the United States (Trybus & Karchmer, 1977).

Figure 1: Reading Comprehension Scores National Distribution for Hearing Impaired Students



(after Trybus & Karchmer, 1977)

Figure 2: Mathematics Computation Scores National Distribution for Hearing Impaired Students



A.A.D./April 1977

(after Trybus & Karchmer, 1977)

> Figure 1 shows that the median reading score at its highest point, for students aged 20 or above, is 147. This corresponds to a grade equivalent of about 4.5. In other words, half the students at age 20 (or at any younger age) read at less than a mid-fourth grade level, that is, below or barely at a newspaper literacy level. What about the high-achieving group? Figure 1 shows that the high point of the 90th percentile line occurs at age 18, where a scaled score of 181 (grade equivalent 8.1) is reached. Thus, at best, only 10% of hearing impaired 18-year olds nationally can read at or above an 8th grade level.
>
> Figure 2 presents a somewhat brighter picture for math computation, generally the highest score area for hearing impaired children. In this case, the mean line for hearing children roughly parallels the 90th percentile line for hearing impaired children, so that about 10% of hearing impaired children can do math computations at the level of the average hearing child of the same age. Most hearing impaired children, however, do much less well even here, and the median hearing impaired 20-year old reaches a scaled score of 177, just below an 8th grade level. A comparable score is obtained by the average hearing child at about age 13. (Trybus & Karchmer, 1977, p. 64)

In terms of personal/social characteristics of entering students, there is qualitative evidence that suggests a constancy in their nature. The data in the 1971 Hanner et al. report, when compared with data collected by the "Foundations" development team in the summer of 1979, show that faculty concerns regarding students' personal and social skills are essentially unchanged over the decade. Furthermore, DeCaro and Emerton (1978) established empirically that there is a developmental lag in the level of social reasoning of entering students vis a vis hearing students in the same age group. Anecdotal information gathered since 1977 suggests that this particular developmental lag still exists among entering students.

Given the apparent stability of entry characteristics over the past decade, it is clear that the original purpose and mission of NTID are not redundant. Further, since the characteristics of entering students have been shown to be stable and, in all likelihood, can be expected to remain so in the foreseeable future, interventions will have to occur at the environmental level and/or in developing certain student competencies once individuals have been identified as NTID students.

Content considerations. In order to be able to successfully enter a major, the learner must be able to demonstrate competence and knowledge in certain technical, personal/social and communication skill areas. Therefore, it has been necessary to specify the knowledge and skills that need to be developed by students during "Foundations" experiences. A content analysis has been conducted, and the findings of this analysis shall be reported separately. The content expectations are being documented by analyzing a course in each major which tests, for the first time, a learner's potential for technical success in that major. The analysis focuses on the identification of not only technical prerequisite skills and knowledge but also communication and personal/social expectations. The content analyses were focused in such a fashion because the report of the Study Group on the Early Stages of Career Development suggested four factors as being necessary for student success:

1. mathematical competency;
2. English language with specific concentration on reading comprehension;
3. the ability to make career decisions;
4. the ability to receive information well enough to be able to understand lectures, questions and directions.

Major Processes Students Must Be Prepared To Perform

Due to the nature of NTID and the nature of the curriculum offered through NTID (technical disciplines), a hearing-impaired student is required to declare the intention to pursue a specific course of study relatively early in his/her tenure at RIT. For example, students wishing to study for most NTID Associate Degrees must be prepared to declare their intention by the start of the Fall quarter of their first year at RIT. Such is the case at most community colleges that offer certificate, diploma or AAS programs of study. This circumstance can be contrasted with that of a learner seeking a Bachelor's Degree in the liberal arts who, more often than not, declares a major and is accepted by a department in his/her third year. Technical curricula at the Associate, Diploma or Certificate levels require that students take highly specialized courses early in their tenure in order that they can complete such curricula within the time limit generally allotted. Unfortunately, many NTID students seeking such certification are not adequately prepared to select or enter a major (Bishop et al, 1979) and often are unable to demonstrate the ability to succeed in the major. For example, the attrition rate from NTID programs since 1974 has been 40 percent and is projected to reach 43 percent (DiLorenzo, Marron & Welsh, 1981) in spite of the special nature of the services and curriculum provided for learners at NTID. In addition, DiLorenzo and Welsh (1981) supported the contention that students are ill-prepared to select or enter a major upon arrival at NTID when they stated that:

> 1. The conclusion and concern of the "Concept Paper" (Bishop, et al, 1979) that many students, upon entering NTID, are not ready to make career decisions is substantiated.
>
> 2. Many students' lack of preparedness to select a major at entrance to NTID is demonstrated by the wide range of majors to which they change.
>
> 3. Significant numbers of students recognize early that they not only selected the wrong major, but they are still not ready to select a career area and elect to spend some time in NCDS. (pp. 14-15)

The Report of the Study Group on the Early Stages of Career Development (Areson et al., 1977) suggested that SVP could be made more effective by emphasizing those activities which have a direct relationship to entering a major. Furthermore, the 1977 summer SVP evaluation report (White, 1978) suggested that the top priority of NTID should be the formulation of a plan to improve student decision making capabilities so that students are able to make sound career decisions at the time of selecting a major. In addition, data collected in the summer of 1979 during intensive workshops with faculty highlighted sixteen problem areas that faculty perceived as needing attention in order to improve the student's likelihood of success at NTID (see Appendix A). Of the sixteen problem areas, six were eliminated from consideration in the "Foundations" development project because the Career Development Programs administrative group perceived them as broader institutional curricular issues, i.e., outside the scope of consideration for "Foundations". The "Foundations" development project continued to consider the problem areas during development so as not to replicate the weaknesses or problems inherent in extant systems. The problem areas isolated for consideration by "Foundations" (see Table 1) relate directly to the processes of career decision making and preparation to enter a major.

TABLE 1

Synthesis of Problem Statements in Appendix A[1]

A. Our students have a limited experiential and information base. (synthesis of original #1 and #5)

B. Our students have a limited knowledge of self, e.g.:

   a. strengths/weaknesses re career clusters
   b. values system
   c. interests

C. In the area of problem solving, our students appear to have a limited repertoire of coping skills and limited exposure to having to make decisions in a variety of contexts and settings. (ref. need to enhance process skills and broaden the information base) (synthesis of original #3 and #4)

D. We are unable to provide appropriate experiences for students who are at various levels of indecision or indecisiveness.

E. There is a gap between students' entry abilities and the criteria for entry into majors, and there is insufficient time to address this gap prior to the students' entry to a major. (synthesis of original #12 and #14)

F. There is a lack of a systematic process for assessing a learner's strengths and weaknesses re majors and for transmitting such information to the learner and to the appropriate administrative authority re the major.

---

[1] Statements 6, 7, 8, 11, 15 and 16 were eliminated at the suggestion of the CDP administrative group. We chose to eliminate #10, as it is subsumed under other problem statements.

Studies conducted to date suggest quite clearly that the outcomes expected of "Foundations" are appropriate and necessary:

1. to better prepare students to select a major;
2. to better prepare students to enter a major.

A Developmental Approach

Foundations will be characterized by a developmental rather than remedial approach to education because the developmental level (Belenky, 1980; Athey, 1980) of an individual influences his/her interpretation of life situations (e.g., selecting and entering a major), and since developmental theory provides some broad indicators of how an individual will react in such situations. Belenky (1980) presents a variety of factors that she suggests contribute to the development of social reasoning. Citing Piaget and Kohlberg, she argues that moral development depends upon having a wide range of role taking opportunities in a variety of social institutions and suggests that the opportunity to participate in an ongoing dialogue is likely to be essential for the development of the individual. She also suggests that hearing-impaired people often experience a deprivation in social interaction (Stokes, 1945; Brunehwig, 1936) and display a lag in understanding the interpersonal dynamics of social relationships (Levine, 1956). Harris (1978), in reviewing four studies of impulse control that utilized standardized assessment (Altshuler et al., 1976; Binder, 1970; Moores et al., 1973; Harris, 1976), concluded that a loss of auditory input appears to have a retarding effect upon the development of impulse control in deaf adolescents. The findings of DeCaro and Emerton (1978), that most deaf students entering the NTID between 1975 and 1977 were operating at the pre-conventional level of reasoning on Kohlberg's (1969) scale of reasoning are therefore not surprising. Belenky (1981) describes the pre-conventional stage as follows:

> ...characterized by hedonism - the good is that which satisfies one's own needs, interests and wishes. The right and needs and feelings of others will be considered to the extent that such considerations are seen as benefiting the self. "Tit for tat" suggests the basis for this thinking which has achieved some liberation from adult constraint. As adults are no longer seen as omnipotent the interests of the self can be asserted more fully...Preconventional adolescents delayed in development are still under the influence of internal and external physical stimuli, rather than that of symbolic representations conceptualizing past and future roles and values which have been shared and self-examined. (p. 8)

This description is remarkably similar to faculty statements characterizing the behaviors of NTID students (Hanner et al., 1971; Appendix A).

While it is clear that the development of the college-age hearing-impaired person lags behind that of his/her hearing peer, it is not altogether clear what can or should be done to facilitate development. There are, however, important suggestions that can be drawn from the literature. For example, irrespective of the model used to study human development (Athey, 1980), implicit in each is the assumption that there will be intensive and prolonged interaction in social settings with peers and mature adults. In addition, Schlesinger (1978) suggests that an adolescent must have meaningful, reciprocal, and largely positive interactions with the environment in order to move through the first three developmental steps described by Erikson (1964; 1968). Further, Belenky (1980) suggests that special efforts should be made to provide young people with two broad kinds of experiences that can enhance their development of moral judgment:

> 1. extensive, participation in the governance of fairly complex and sizable democratic institutions where...conflicts would be fully debated...
>
> 2. working with others on an individual basis where such qualities as care, responsibility, and understanding are essential and reciprocated (p. 42).

"Foundations" experiences will include meaningful, reciprocal, and positive interaction in social settings with peers and mature adults. Learners will be provided opportunities for involvement in the governance of complex democratic systems where there is human interaction directed at the resolution of conflicts inherent in such systems.

First Process - Managing and Coping with Conflict

Since many learners come to NTID ill-prepared to enter and select majors, there is a need for such preparation to occur at RIT. The environment of RIT is significantly different from that to which most learners are accustomed. Even those students who have attended the most academically stringent of preparatory high schools find the transition to a university setting to be a formidable challenge. Such a challenge is even more formidable for hearing impaired students who may be, for the first time, in an educational setting where the student body is predominately hearing. An antecedent to preparing to select and enter a major is, therefore, the ability to manage or cope with the conflicts inherent in the transition from the pre-college environment to the RIT environment. The strategies which can be used in the resolution of such conflict are similar to those that have been isolated for persons making the transition from one culture to another: adherence, substitution, addition, synthesis, and creation (Wasilewski & Mitchell, 1980). Similarly there are general social competencies, e.g. role-taking, knowledge of alternative strategies and the appropriate use of alternative strategies (Weinstein, 1969), which can be helpful in resolving the conflicts in such a transition. Such conflicts are often related to differences in attitudes, patterns of thought, social organization, roles and role perceptions, language, use and organization of space, time conceptualization and non-verbal expression (Samovar & Porter, 1976), i.e., there is a knowledge and skill component to managing and coping in a cross cultural "type" setting. The faculty of NTID (Table 1) have isolated informational and process skills necessary to facilitate student success.

Foundations experience will attempt to optimize the potential for students' managing and coping with the conflicts inherent in the transition to college by:

1. assisting students in identifying the differences between their attitudes, patterns of thought, social organization, roles and role perceptions, use and organization of space, time conceptualization and non-verbal expressions and those that are expected of students at RIT.

2. helping students become aware of and gain skill in the appropriate alternative strategies that are available to resolve the differences.

In order to be of assistance to students in this respect, Foundations experiences and NTID must provide learners with a clear series of expectations regarding social organization, roles, use and organization of space, use and organization of time and the like.

Second Process - Decision Making

The selection of a major is a decision-making activity. Student decision making will be a second major process to be facilitated/developed by "Foundations" experiences. Steve (1980) has suggested reasons, well supported in the literature, why an individual does not succeed in a decision-making situation:

1. He suggests that individuals can fail because they lack the prerequisite skills to search out, recognize and use relevant information. This is best described by Gagne's (1968) theory of hierarchies of learning and could be termed the "learning deficit explanation."

2. Individuals may fail because their information processing capabilities are taxed beyond their limits. Steve refers to this as the "biological limitation explanation" which has been described by Simon (1976).

3. He suggests that poor decision making involves the conflict individuals feel in decision situations with important consequences. He refers to this as the "decisional conflict explanation" best described by the model constructed by Janis and Mann (1977).

The entering student, in order to be successful, must be able to function in many situations under varying degrees of risk, informational and time constraints. Most, if not all, of these situations require the student to make decisions of varying degrees of importance and to recognize the relative degrees of importance vis a vis their outcome.

Steve (1980) recommends that certain environmental modifications regarding information and time can be made to foster quality decision-making. He also identifies certain considerations internal to the decision maker, regarding risk, which also must be addressed to facilitate decision-making.

Environmental considerations. With respect to information Steve recommends that, to facilitate student career decision-making, "Foundations" should consider: the type of information required in the decision, the availability of that information, the presentation form of the information which students may need, and strategies to insure that the information is accessible at the time the decision is made. There will be three principles used in the determination of career decision information to be incorporated into "Foundations" experiences:

1. the information must be useful or relevant to the career decision of selecting a major;

2. the information must be available to students in an economic fashion relatively free of distractor information;

3. the information must be accessible to the student at the time the decision is being made.

In addition, there must be a component of "Foundations" which seeks to develop information search, recognition and use skills because:

a. such skills are generalizable to new decision situations;

b. the necessary information for most decisions is almost never neatly presented to a decision maker.

With respect to *time*, the human is a biologically-limited information processor, and the three principles listed above are a necessary but not sufficient consideration in facilitating development of decision-making regarding selection of a major. There is often insufficient time for students to process the information necessary to make an appropriate selection of a major.

As indicated previously, the Study Group On The Early Stages of Career Development (1977) recommended that students need more time for making career decisions. It is therefore necessary for "Foundations" experiences to provide students with more time than is currently allotted for making career decisions. This can be accomplished, in part, by initiating certain of the "Foundations" experiences prior to students' arriving on the RIT campus.

Internal considerations. In addition to time and information, which can be controlled environmentally, there are perceptions and beliefs internal to the decision maker that affect the quality of the decision processes used. These perceptions relate to the *risk* in continuing a current course of action, the *risk* involved in changing a course of action, and the *belief* that a better solution can be found. These perceptions need to be clarified by the individual making a decision and need to be brought into conjunction with the realities of the decision situation. It is in the articulation, clarification and bringing into conjunction of perceptions and "realities" that there is a need for intensive human interaction. The individual involved in decision-making should interact with a person or persons who can objectively facilitate reflection upon perceptions of risk and the belief in the existence of potential solutions. Such a role can be played by counselors, mentors (Hawkins, 1980), peers (Osguthorpe, 1980) or classroom teachers. The concern is not so much *who* is the facilitator but rather that the facilitation can be *demonstrated* to be occurring systematically. Due to the complex nature of such facilitation, it will be necessary to have mature adults play this role, and it will also be necessary to design some "formal" experiences that encourage reflection. The third major process to be an integral part of "Foundations" experiences will focus upon reflection.

Third Process - Reflection

Dowaliby and Pagano (1981) have pointed out that a learner enters a decision situation with a multitude of previous experiences, and that some of these experiences share characteristics with the current decision situation. In order to negotiate a new situation, the decision maker must first isolate the characteristics of past experiences which are salient to current circumstances. Based on the past experiences and the configuration of the current circumstances, the person will have certain expectations regarding his/her chance of success in meeting the challenges embodied in the new situation. The expectation will influence the amount of effort the individual is willing to expend. This leads to action and a resulting outcome along a success continuum. The outcome will generate an affective response in the decision-maker, and the accuracy of causal ascription will depend upon:

1. correct analysis of the decision task,
2. accurate perception of own resources relative to the decision task,
3. adequate expenditure of effort.

In order to grow, an individual must be able to identify what he/she did that contributed to the resolution of a decision conflict and to store that as part of the experience base to be mobilized in future situations (Athey, 1980). The more the learner engages in the process just described and the greater the range of experiences assimilated, the greater the probability that, faced with a situation with different surface stimuli, he/she will be able to identify shared general characteristics with previous experiences and apply learnings from these previous experiences to the resolution of the new situation.

"Foundations" will therefore attempt to develop students' abilities to:

1. reflect upon past experiences and determine which of those experiences are related to a decision situation at hand;

2. isolate those characteristics of said experiences that are salient to the decision situation at hand;

3. project a series of expectations regarding success and willingness to expend effort;

4. accurately assess one's own resources relative to the task at hand;

5. adequately expend effort (take some action) in accomplishing the task at hand.

Here again there will be a need for intensive interaction between a decision maker and a facilitator. Such interaction will need to be student-centered (Hawkins, 1981), i.e., the primary objective of the interaction is student development, and the facilitator must be flexible in order to meet the student's needs as a developing human being.

Several reviews of the literature (Athey, 1980; Belenky, 1980; Dansereau, 1980; Dowaliby & Pagano, 1981; Kraft, 1980; Steve, 1980; Whitaker, 1980) have indicated the need to assist students in identifying the relationship between characteristics of previous experiences and those of current experiences. Focusing upon the affective and cognitive outcomes of prior experiences will help to establish a baseline for addressing new experiences.

Fourth Process - Studying

Upon entering an institution of higher education students are expected to be prepared to engage in independent learning. However, data indicate that students enrolling at NTID are weak in such skills. For example, Hanner et al. (1971) listed a series of "observations on which there was substantial agreement among instructors about the deaf students" (p. 11). One such observation was that students are "not fully aware of the effort and learning strategies required to be successful in studies at the post-secondary level" (p. 12). This condition has remained substantially unchanged--a needs assessment conducted with faculty in 1979 (see Appendix A) uncovered essentially the same concerns. Faculty in the Advanced Program support teams and General Education Programs continue to offer study skills courses to hearing-impaired learners. Further, career counselors offer seminars to students in NTID's certificate, diploma and associate level programs on such topics as time management, scholastic motivation, studying for exams and coping with differing teaching styles. In effect, considerable resources have been directed at developing students' abilities to learn and study.

The fourth process to be facilitated by "Foundations" experiences will be the development of study skills. To facilitate discussion, studying will be broken into two broad categories: willingness to study and studying strategies.

Willingness to study. Willingness to study is dependent upon the student's perceiving a need for studying in order to achieve his/her goals. In an attempt to identify the goals of entering NTID learners, Stinson (Lang and Stinson, 1981) conducted a study in which twenty students were interviewed. The students were administered a standard set of open-ended questions in order to determine why they had come to NTID, what were their concerns upon entry and what was most exciting to them upon entry. The reason most commonly identified by the students for coming was "social" with "academic reasons" being cited second -- the difference between the two was statistically significant. Further, it was found that entering students felt that attending college was of real value for their future but were not able to articulate their career goals very well. In addition, the students expressed concerns about entering a career and being successful academically but they less frequently expressed concerns (statistically significant) about establishing social relationships or self maintenance (funds etc.). Students may be willing to study but may be placing study in a secondary position as compared to socialization. Anecdotal information collected from career counselors, faculty and staff tends to support this contention.

When a student's willingness to study is in question, the student must first know what is required, regarding study, to succeed at college and must compare this with his/her own expectations. That is, the student must compare and contrast the study effort and skills deemed necessary for college success with his/her own expectations regarding study, academics, and socializing, and must identify the discrepancy between the two. As a result, the student will know a discrepancy exists but may not comprehend the meaning of the discrepancy since he/she most likely has not had to demonstrate the study behaviors necessary for success in college. It is necessary for the learner to experience a situation in which he/she has an opportunity to test the reality of discrepancies identified. Such an experience will need to be processed by the learner (see the section on Reflection) in order for him/her to begin to understand the magnitude and the nature of the discrepancies and to take some action to eliminate these discrepancies.

Study related skills. A student may be willing to expend effort in studying but may lack certain study skills. For example, students may not possess the skills to manage their schedules and prioritize competing social and academic time demands. In addition, students may not possess adequate skills at identifying and understanding relationships in what they study, selecting the important material from what they study and cognitively reorganizing the materials into a personalized schema (Long, Hein & Coggiola, 1978).

Dansereau et al. (1979) describe a series of six primary comprehension-retention and retrieval-utilization learning strategies: mood setting, understanding, recall, digesting, expanding and reviewing. They also identified a series of support strategies for optimizing the internal psychological environment of the learner: goal setting and scheduling, concentration management, monitoring and diagnosing. A learning strategy system, composed of instruction in these primary and secondary strategies, was developed and used with college-age learners. The system proved to be effective in enhancing the behaviors and attitudes of participants (Dansereau et al., 1979). Dansereau (1980) suggests that many learners could benefit from such skills and strategy training courses. He recommends that, if possible, "the skills and strategy programs should be run in parallel with regular content courses" (p. 88).

Developing studying skills. "Foundations" experiences will include a component which focuses upon:

1. assisting students in identifying the discrepancy between study behaviors needed in college and their behaviors prior to entering college;

2. providing students the opportunity to test the reality of this discrepancy by participating in rigorous academic activities which require study for success and in which they can be successful if they study;

3. facilitating reflection upon experiences (2 above) in order to assist students in focusing upon the effort and skills needed for academic success;

4. providing skill and strategy instruction of the type developed by Dansereau et al. (1979).

Summary

In summary, there are four processes upon which "Foundations" will focus in order to better prepare students to select and enter majors:

1. coping with or managing the conflicts inherent in the transition to the college environment;

2. decision-making;

3. the ability to reflect upon past experiences, relate these to new experiences and take action regarding the new experiences;

4. studying and demonstrating a given level of competence vis a vis certain skills and knowledge areas.

Design Principles

There are a variety of orientations that could have been selected to characterize "Foundations" experiences: a learner-centered orientation, a content-centered orientation, or an instructor-centered orientation (Hawkins, 1980). "Foundations", from its inception, has derived its focus from a commitment to better meet entering NTID students' needs in preparing to select and enter majors. It is appropriate, then, that the hallmarks of "Foundations" experiences, i.e. its tenets, be directly tied to fulfilling this commitment. "Foundations" will be an integrated set of learner-centered experiences.

In the learner-centered orientation, the needs of the student for overall human and social development are considered to be primary (Hawkins, 1980). Chickering (1981) suggests that learning and human development are additive and occur in the context of a student's past history, personal characteristics and motives. He states that, "this makes information about the knowledge and competencies gained from work and life experiences especially important in designing effective education..." (p. 16). He suggests that, "we are tackling the bedrock task of human development..." (p. 16) when we attempt to achieve the end of effective preparation for work. This is particularly relevant when one considers a series of generic competencies identified by Klemp (1977) as necessary for success on a job:

1. communication skills,
2. information processing skills, conceptualizing skills,
3. ability to learn from experience,
4. ability to understand many sides of a complex issue,
5. accurate empathy, positive regard for others,
6. giving assistance, controlling impulsive feelings,
7. define oneself as actor, cognitive initiative, proactive stance.

Very often curriculum will sacrifice the development of these generic skills for the development of content area knowledge. "Foundations" experiences will seek to facilitate the development of the seven skills areas cited above. In so doing, student needs and level of development will be considered to be of primary importance. Since education is the process of movement from one skill, attitudinal, knowledge, or developmental level to another, students' entering skill, attitudinal, knowledge or developmental levels will be the starting point for "Foundations" experiences. Since learner-centered experiences focus upon "meeting the student where he/she is" and facilitating movement to where he/she needs to be in order to successfully meet academic challenges, "Foundations" experiences will be designed to accommodate entering students' developmental levels, while providing the conditions to facilitate the attainment of higher levels of development.

The learner-centered orientation will not, however, be taken at the exclusion of the other orientations. There will be a degree of content-centeredness in "Foundations" experiences. In a strict content-centered orientation, teachers and students would be expected to adjust their behaviors or attitudes to accommodate the requirements of the content disciplines (majors). The majors would, in effect, dictate the skills, facts or propositions that must be acquired, and there would be little room for deviation. Such an orientation is the one most often taken by those of us educated in technical disciplines. Unfortunately, the pre-requisite skill requirements of a discipline are not quite as unambiguous as one might expect at first glance. While a content analysis can isolate broad and general skill requirements across disciplines, there is debate within disciplines regarding the specific competencies necessary to enter a career area. Since "Foundations" will be held accountable for better preparing students to enter a major, there will be a need for a degree of content-orientation but, since disciplines are not static and there is a lack of clarity regarding prerequisites, it will be necessary that the content addressed in "Foundations" be common across NTID disciplines.

In addition, there will always be a need for those valuable insights, anecdotes and touches of humanity that can be provided only by a teacher with experience. There is, therefore, the need for a degree of instructor orientation in "Foundations". Taken to the extreme, however, an instructor considers him/herself to be "the" model for students to emulate, i.e., the unique approach he or she takes to teaching is considered to embody the content taught. The student is expected to go to the teacher in search of wisdom and is expected to accommodate his or her personality or style.

Principles

There are four principles that will be utilized in designing "Foundations" experiences:

1. there will be a set of rigorous institutional expectations, explicitly stated;

2. if expectations are met by the student, success will be experienced; if expectations are not met, there probably will not be a successful outcome;

3. there will be a high level of interaction between students and faculty, as well as between entering students and older students;

4. "Foundations" experiences will be designed to move from a concrete, experiential base toward abstraction and generalization.

Wherever possible these four principles will be adhered to in the design, construction, and implementation of "Foundations" experiences.

Rigorous expectations, explicitly stated. The college environment places demands upon students' adaptive skills, in terms of meeting both social and academic expectations. Currently, the first experience most students have at NTID, the Summer Vestibule Program, tests a student's ability to cope socially but does not provide an accurate and realistic sampling of the academic demands a student will face in the Fall Quarter and beyond. Therefore, realistic and accurate academic expectations will be established from the student's first contact with "Foundations".

The need for explicit statement of the expectations derives from most students' limited experience with inferring rules and correctly interpreting unstated expectations from abstract and loosely-connected experiences. Since students' developmental levels may require clarity of communication, a minimum set of institutional expectations will be made explicit to the student from the beginning of his/her association with NTID.

Experiencing success if expectations are met. Explicit statements of expectations are a necessary but not sufficient condition for optimizing a student's chances of success. For example, with respect to acceptable levels of studying, academic success can be accomplished through the utilization of support systems (e.g., tutoring, mentoring, study skills instruction, etc.) which will optimize the probability that the student can meet the challenges of academic college.

Dowaliby and Pagano (1980) has pointed out that a person will attribute success to his/her own actions if he/she has succeeded in a situation that was challenging, in which he/she expended a reasonable amount of effort and in which he/she expected to succeed. Although "Foundations" experiences will be designed to optimize success, they will be challenging and require considerable expenditure of effort on the part of the student.

A high level of interaction. Many students come to NTID with limited experiences in interacting with adults, peers, and social systems. Communication difficulties with hearing individuals and restrictive environments in many schools are primary contributors to the reduced frequency of such interaction. Liben (1978) suggests that a deprivation in a student's experience may have serious consequences for development:

> Social experience may also be divided into two components. First, social interaction provides the opportunity for transmission of the society's knowledge, traditions, mores, values, etc., through both formal and informal means, for example, school and family. Second, social interaction provides the opportunity for the child to develop social-cognitive skills. Interactions with adults and peers force the child

> to recognize that others' viewpoints may differ from his or her own, thus helping the child to decenter from the egocentric perspective of preoperational thinking. (p. 198)

"Foundations" will be designed to encourage and facilitate reciprocal social interaction with peers and adults through systems of mentoring, student participation in the governance of "Foundations" experiences and non-didactic approaches to teaching. In addition, major emphasis will be placed upon facilitating students' development of competency in the four major processes until they are able to perform the processes with limited assistance.

Concrete to abstract. Learners entering NTID tend to be pre-conventional in their thinking (DeCaro and Emerton, 1978), and persons at the pre-conventional level are "...still under the influence of internal and external physical stimuli, rather than that of symbolic representations conceptualizing past and future roles and values which have been shared and self-examined" (Belenky, 1980, p. 8). Colby and Kohlberg (1973), Kohlberg (1969), Kohlberg and DeVries (1969), and Kuher, Kohlberg, Langer and Haan (1975) have shown that there is a corresponding stage in Piagetian developmental levels for each moral stage. Belenky (1980) has, however, pointed out that mature cognitive reasoning does not automatically assure that there will be maturity in moral reasoning. She also indicates that while evidence shows (Furth, 1964; 1966; Vernon, 1967) that the early stages of cognitive development described by Piaget are not delayed in deaf children, the evidence is not so clear for development of formal operational thought. She suggests that "if hearing impaired adolescents are unusually delayed in achieving the capacity for abstract, formal thought, that delay could contribute to the unusually low levels of moral reasoning in (deaf) college students observed by DeCaro and Emerton (1978)" (p. 22). It remains to be seen if students do lag in the achievement of formal thought; however, ancedotal information would tend to indicate that such a lag is likely.

Parasnis and Long (1978) have reported data which show that NTID students tend to be more field dependent than their hearing peers. Further, Dowaliby (study in progress) has found that NTID students are more people oriented and desire greater structure in a learning situation than do their hearing counterparts -- these are traits characteristic of field dependent persons. There is data (Koran, Snow & McDonald, 1971; Maranty & Dowaliby, 1973a; 1973b) which establishes a trait-treatment interaction between field dependence/independence and destract/concrete presentations of learning materials. For example, Koran et al. (1971) suggest that "...explicit, concrete presentation of the stimulus elements...may provide a behavioral representation for the learner that he could not generate for himself..." (p. 226). Concrete models and well illustrated verbal presentations appear to serve a compensatory function for field dependent learners.

While there are no studies regarding deafness which link the constructs cited above to the desirability of concrete vs. abstract instrumentation, the data are considered to be strong enough to warrant addressing learners in such a fashion as to progress from the concrete to the abstract in "Foundations" experiences. A variety of concrete and tangible experiences will be designed to provide opportunities for students to take many roles, to interact with adults and peers, to take reasonable risks, to take an active problem-solving stance and to experience cause-effect relationships. Such opportunities are often missing from many students' backgrounds and are necessary if the students are to successfully master the four processes put forward in this paper.

Concomitantly, "Foundations" experiences will begin the process of moving toward the abstract and generalizable - with appropriate supports to enable the student to do so. Given the current status of the technical courses in various majors, preparedness to enter translates partially into the ability to manipulate abstractions and to make generalizations. It would be a disservice to students not to attempt to facilitate the development of such abstract reasoning processes.

There are some hypotheses and assumptions which have been made in developing this conceptual framework that will be tested during the pilot and implementation phases. For example, it is hypothesized that most entering students have attained the level of concrete operational thought but not formal reasoning—this will be tested. Finally, the "Foundations" concept - as well as the concept of an NTID - are essentially embodiments of the hypothesis that significant interventions can be made to facilitate the development of hearing-impaired individuals.

Conclusion

This document proposes four major processes that "Foundations" experiences should address in order to better prepare students to select and enter majors. The paper also proposes some broad principles to be used in the design of such experiences. The proposal of these processes and design principles comes as the culmination of a needs assessment and approximately two years of dialogue regarding several theoretical constructs. This document submitted to NTID as the conceptual framework around which "Foundations" will be designed.

Bibliography

Altshuler, K.Z., Deming, W.E., Vollenweider, J.D. & Tendler, R. Impulsivity and profound early deafness: A crosscultural inquiry. Americal Annals of the Deaf, 1976, 121, 331-345.

Areson, A., Doe, S., Kadun~~e~~k, N., Long, J., Maruggi, E., and White, K. Report of the Study Group on the Early Stages of Career Development. Unpublished manuscript, National Technical Institute for the Deaf at Rochester Institute of Technology, February 1977.

Athey, I. Theories and models of human development: Their implications for the education of the deaf (Foundations literature review series). Unpublished manuscript, National Technical Institute for the Deaf at the Rochester Institute of Technology, 1980.

Belenky, M.F. The role of deafness and educational in the moral development of hearing impaired children adolescents (Foundations literature review series). Unpublished manuscript, National Technical Institute for the Deaf at the Rochester Institute of Technology, 1980.

Binder, P.J. The relationship between verbal language and impulsivity in the deaf (Doctoral dissertation, Wayne State University, 1970). Dissertation Abstracts International, 1971, 32, 5614B-5615B. (University Microfilms No. 71-384).

Bishop, M., Crandall, K., Hinkle, W., Peterson, B., Streim, N. & Vos, S. Early stages of career development: A concept paper. Unpublished manuscript, National Technical Institute for the Deaf at the Rochester Institute of Technology, 1979.

Brunchwig, L. A study of some personality aspects of deaf children. New York: Teachers College, Columbia University, 1936.

Chickering, A.W. Integrating liberal education, work, and human development. American Association for Higher Education Bulletin, 1981, 33(7), 1-17.

Colby, A. & Kohlberg, L. The relation between the development of formal operations and moral judgement. In D. Bush & S. Feldman (Eds.), Cognitive development and social development. Relationships and implications. New York: Lawrence Earlbaum Associates, 1973.

Dansereau, D. Transfer of learning from one setting to another (Foundations literature review series). Unpublished manuscript, National Technical Institute for the Deaf at the Rochester Institute of Technology, 1980.

Dansereau, D.F., McDonald, B.A., Collins, K.W., Garland, J., Holley, C.D., Dickhoff, G.M. & Evans, S.H. Evaluation of a learning strategy system. In H.F. O'Neil, Jr. and C.D. Spielberger (Eds.) Cognitive and affective learning strategies. New York: Academic Press, 1979.

DeCaro, P.A. & Emerton, G. A cognitive developmental investigation of moral reasoning in a deaf population. Paper presented at the American Educational Research Association Annual Meeting, Toronto, 1978.

DiLorenzo, L., Marron, M. & Welsh, B. Student, graduate or dropout? (Concept paper - follow-up report IV). Unpublished manuscript, National Technical Institute for the Deaf at the Rochester Institute of Technology, 1981.

DiLorenzo, L. & Welsh, B. Changing programs and majors: How many? when? where? (Concept paper - follow-up report II). Unpublished manuscript, National Technical Institute for the Deaf at the Rochester Institute of Technology, 1981.

Dowaliby, F.J. & Pagano, J.A. Locus of control: Review and implications for instruction of the hearing-impaired (Foundations literature review series). Unpublished manuscript, National Technical Institute for the Deaf at the Rochester Institute of Technology, 1981.

Erikson, E.H. Insight and responsibility. New York: Norton, 1964.

Erikson, E.H. Identity, youth and crisis. New York: Norton, 1968.

Gagne, R.M. The conditions of learning. New York: Holt, Rinehart and Winston, 1977.

Hanner, B., Badamy, J., Berry, H., Consaul, V., Rucker, T., Stuckless, R., Titus, J. & Young, J. Toward the identification of educationally significant traits of post-secondary deaf students. Unpublished manuscript, National Technical Institute for the Deaf at the Rochester Institute of Technology, 1971.

Harris, R.I. The relationship of impulse control to parent learning status, manual communication, and academic achievement (Doctoral dissertation, New York University, 1976). Dissertation Abstracts International, 1977, 37, 4682B. (University Microfilms No. 77-5410).

Harris, R.I. Impulse control in deaf children: Research and clinical issues. In L.S. Liben (Ed.), Deaf children: Developmental perspectives. New York: Academic Press, 1978.

Hawkins, R. Primary monitoring as a teaching strategy (Foundations literature review series). Unpublished manuscript, National Technical Institute for the Deaf at the Rochester Institute of Technology, 1980.

Janis, I.L. & Mann, L. Decision making. New York: The Free Press, 1977.

Kaufman, R.A. Educational System Planning. Englewood Cliffs: Prentice Hall, 1972.

Klemp, G.O., Jr. Three factors of success. In D.W. Vernilye (Ed.) Relating work and education. San Francisco: Jossey-Bass, 1977.

Kohlberg, L. Stage and sequence: The cognitive developmental approach to socialization. In D.A. Goslin (Ed.) Handbook of socialization theory and research. Chicago: Rand McNally, 1969.

Kohlberg, L. & DeVries, R. Relations between Piaget and psychometric assessments of intelligience. Paper presented at the Conference on the National Curriculum, Urbana, Ill., 1969.

Koran, M.L., Show, R.E. & McDonald, F.J. Teacher aptitude and observational learning of a teaching skill. Journal of Educational Psychology, 1971, 62, 219-228.

Kraft, R.J. The theory of experiential learning (Foundations literature review series). National Technical Institute for the Deaf at the Rochester Institute of Technology, 1980.

Kuhn, D., Kohlberg, L., Langer, J. & Hoan, U. The development of formal operations in logical and moral judgement. Genetic Psychology Monographs, 1975.

Lang, H.G. & Stinson, M. Career education and socioeconomic status of deaf persons: Concepts, research and implications. Unpublished manuscript, National Technical Institute for the Deaf at the Rochester Institute of Technology, 1981.

Levine, E.S. Youth in a soundless world. New York: New York University Press, 1956.

Liben, L.S. Developmental perspectives on the experiential deficiencies of deaf children. In L.S. Liben (Ed.) Deaf children: Developmental perspectives. New York: Academic Press, 1978.

Long, G., Hein, R. & Coggiola, D. Networking: A semantic-based learning strategy for improving prose comprehension (Department of R & D Paper Series No. 26). Unpublished manuscript, National Technical Institute for the Deaf at the Rochester Institute of Technology, 1978.

Marantz, S. & Dowaliby, F.J. Film versus lecture methods of instruction as related to imageability. Paper presented to the American Educational Research Association, 1973a.

Marantz, S. & Dowaliby, F.J. Individual differences in learning from pictoral and verbal instruction. Unpublished report, University of Massachusetts, 1973b.

Moores, D.F., Weiss, K.L. & Goodwin, M.W. Evaluation of programs for hearing impaired children: report of 1972-1973 (Research Project No. 57, Project No. 332189, Grant No., OE-332189-4533). Minneapolis: University of Minnesota Research, Development and Demonstration Center in Education of Handicapped Children, 1973.

Osguthorpe, R.T. Tutoring special students (Foundations literature review series). Unpublished manuscript, National Technical Institute for the Deaf at the Rochester Institute of Technology, 1980.

Parasnis, I. & Long, G.L. Relationships among spatial skills, communication skills, and field independence in deaf students. Perceptual and Motor Skills, 1979, 49, 879-887.

RIT Official Bulletin. Vol. LXXX, No. 3. Rochester, New York: Rochester Institute of Technology, May, 1980.

Samovar, L.A. & Porter, R.E. Intercultural communications: A reader. Belmont, California: Wadsworth Publishing Company, 1976.

Schlesinger, H.S. The effects of deafness on childhood development: An Eriksonian perspective. In L.S. Liben (Ed.) Deaf Children: Developmental perspectives. New York: Academic Press, 1978.

Simon, H.A. Administrative behavior: A study of decision-making processes in administrative organization. New York: Free Press, 1976.

Steve, M. Problem solving and decision making: A review of the literature (Foundations literature review series). Unpublished manuscript, National Technical Institute for the Deaf at the Rochester Institute of Technology, 1980.

Stokes, W. Sign language structure: An outline of the visual communications systems of the American deaf. Buffalo: University of Buffalo, 1945.

Trybus, R.J. & Karchmer, M.A. School achievement scores of hearing impaired children: National data on achievement status and growth patterns. American Annals of the Deaf, 1977, 122(2), 62-69.

Weinstein, A.R. The development of interpersonal competence. In D. Goslin (Ed.) Handbook of socialization theory and research. Chicago: Rand McNally, 1969.

Wasilewski, J.H. & Mitchell, J.D. Martin. Multicultural coping and adaption competencies (Foundations literature review series). Unpublished manuscript, National Technical Institute for the Deaf at the Rochester Institute of Technology, 1980.

Whitaker, U. Experiential learning as a teaching strategy for the career education of hearing-impaired college students (Foundation literature review series). National Technical Institute for the Deaf at the Rochester Institute for the Deaf at the Rochester Institute of Technology, 1980.

White, Karl R. A Summary Report of an Evaluation of NTID's 1977 Summer Vestibule Program: Report #1. Unpublished manuscript, National Technical Institute for the Deaf at Rochester Institute of Technology, March, 1978.

APPENDIX A

Problem Statements Isolated In 1979

1. Our students have a limited knowledge base and frequently have preconceived notions re careers and majors.

   1. Work experience limited
   2. Sex-stereotypes
   3. Majoring in college, liberal arts/tech
   4. External influences on choice
   5. Expectation/ability don't mesh
   6. Personality influences (don't like chairperson - won't major in that dept)
   7. Misconception of majors (civil tech. bulldozer driver)
   8. Choice of majors influenced by ideas of salary
   9. Limited exposure to career options and role models

2. Our students have a limited knowledge of self, e.g.,
    a. strengths/weaknesses re career clusters
    b. values system
    c. interests

1. External control (peers, parents, etc.)
2. Ability and expectations don't mesh
3. Lack of ability to introspect
4. Help seeking (wrong person, wrong time, wrong way)
5. Very limited experiential base/lack of feedback
6. Unwillingness to take responsibility for decision (seeks a solution, not advice)
7. No developed value system - or underdeveloped
8. Black and white way of viewing the world, values, behaviors

3. Our students use unsophisticated processes for decision-making.

    1. Don't consider alternatives, risks, consequences
    2. External influences on decision (peers, parents)
    3. Accountability - we don't hold students accountable, students won't accept accountability
    4. Discrepancy between social expectations and real limitations of a disability
    5. Process students use (if they use one) seems to be based on "today"
    6. Limited information on which to base a decision
    7. Seek decisions from authority rather than making decision for self

4. Our students lack a repertoire of coping skills.

    1. Unwillingness to face problems (transfers, LOA, turn-off when encounter difficulties) (fear of failure??)
    2. Inability to transfer what they did in one situation to another (English skills to photo, strengths in solving problems in past to solving problem now)
    3. Need for immediate response to problem
    4. Lack of awareness of normal range of problems
    5. Locus of control (other people need to change; they control my destiny)
    6. Students can't separate problems (all are intertwined)
    7. Problems with time management and setting priorities

5. Our students possess an inadequate knowledge base re cultures and their development.

    1. Stereotyped ideas about careers and groups
    2. Rigidity and low tolerance for differences
    3. Lack of appreciation for deaf culture, where they come from
    4. Don't understand dynamics of a setting
    5. Severe culture shock upon arrival at NTID
    6. Inability to judge life experiences, to be non-judgmental about things they can't always be judgmental about
    7. Generalizability - transferability - applicability of principles, concepts

6. An NTID student's sense of purpose and identity emanates primarily from affiliation with a major.

   1. Lack of incentive for courses outside the major or when in NCDS
   2. External control on I.D. (also transient)
   3. Crash when don't have a major
   4. Identification may be with people in major, not major itself

7. There is no centralized body which reviews and monitors an individual student's flow as well as aggregate student flow.

   1. Only counselor has access to all info but everytime the student changes, he gets a new counselor
   2. Lack of uniformity/uniform criteria in how departments determine if students can transfer in or out
   3. Changing roles of counselors, staff chairpersons leave question of authority/responsibility up in air
   4. No one person is totally aware of any one student's history
   5. Our attitude makes it easy for students to change
   6. It may be preferable not to have a centralized body/big brother
   7. When counselors change, info about students is lost - student may make same mistake again and again

8. We lack an institutional definition of aberrant student flow.

   1. Don't have parameters to vary from (#'s of changes, time limits, etc)
   2. Ambivalence re LOA's, changes
   3. Ethical/Policy Issues - How much time, resources is one student entitled to? etc.

9. We are unable to provide appropriate experiences for students who fall in the different cells of the matrix.

	Has Necessary Skills For Major	Does Not Have Necessary Skills for Major
Knows what major he/she wants and it is an NTID/RIT major		
Knows what major he/she wants and it is not offered at NTID/RIT		
Does not know what major he/she wants		

1. How far does NTID's responsibility go in providing experiences for all students?
2. We aren't making enough use of individualized instruction, multiple entry points
3. Low-skill students very frustrated in skill improvement tracks

10. Students are forced to choose a career direction prior to being ready and able to do so.

    1. External influence on decision-making
    2. Lack of information
    3. How can we measure when students are "ready" for a decision
    4. Our structure forces people into choices which may be premature

11. Students lose an unacceptable amount of time and credit in transferring from major to major.

    1. Lack of multiple entry times
    2. Lack of options for students who are undecided or who want to change majors in quarter when new major isn't opening
    3. Students lose time even in natural changes (Civil or Arch to Indust. Drafting; C.S. to NBTD)
    4. Students "in-between" majors lose motivation to study

12. There is a gap between students' entry abilities and the criteria for entry into majors.

    1. Our entry criteria may be unrealistically low considering how far we have to move students by time of major (entry and exit) and the amount of time we have to do it in
    2. What are implications of our criteria for multiply-handicapped students
    3. Secondary schools' records cannot always be relied upon
    4. Need better assessment of skills and transmittal process to students for early discussion of most realistic and most unrealistic options open to students

13. There is a lack of a systematic process for assessing a learner's strengths and weaknesses re majors and for transmitting such information to the learner and the appropriate administrative authority re the major.

    1. Team concept - good concept, what will happen to it? Could lead to fragmentation re the student's input
    2. Who is responsible for transmitting info to student, to faculty
    3. Tests may not be valid with our population

14. There is insufficient time to develop process skills and content mastery prior to the student's entry to a major.

    1. Validity of requirements/false requirements
    2. Treating all students as if they all had same needs
    3. Lack of experiential base

15. **We lack multiple entry points to NTID and to majors.**

    1. **Strategies like - multiple sections, self-pacing**
    2. **What is pay-off of going to multiple entry - how many students are we talking about**
    3. **NTID-RIT-NTID flow may put students out of sequence**

16. We lack specified institutional, departmental and major requirements for institutional curricular offerings and for certification of students.

    1. The requirements we do have, we don't enforce
    2. Validity of requirements
    3. Sequencing of requirements

SECTION I:

DEVELOPMENT OF THE LEARNER

Theories and Models of Human Development:
Their Implications for the Education of the Deaf

Irene Athey

Theories and Models of Human Development:

Their Implications for the Education of the Deaf

Irene Athey
Rutgers University

The major purpose of the present review is to abstract from a broad range of developmental theories and models those aspects that pertain to the adolescent and young adult and to integrate these aspects in such a way as to present a composite picture of the "typical" or "normal" person of this age. The models will be scrutinized for indications or predictions as to ways in which persons who, by reason of some handicapping condition or environmental deprivation or some combination of the two, either fail to reach or deviate from the expected norm.

The review will be in four sections:

I. Theories and Models

A. Philosophical

1. Maturational-biological
2. Environmental:
3. Interactionist

B. Cognitive-Learning

1. Maturational-biological: Jensen, Gesell
2. Environmental: Pavlov, Watson, Skinner
3. Interactionist: Piaget

C. Language

1. Maturational-biological: Chomsky, Lenneberg
2. Environmental: Skinner, Staats, Luria
3. Interactionist: Bloom, Cazden

D. Personality

1. Maturational-biological: Freud
2. Environmental: Mead, Benedict, Bandura-Walters
3. Interactionist: Erikson, Havighurst

E. Morality

1. Maturational-biological:
2. Environmental:
3. Interactionist: Kohlberg, Maslow

F. Education

1. Maturational-biological: Montessori
2. Environmental: Gagne
3. Interactionist: Cronbach-Snow

BEST COPY AVAILABLE

G. Vocational

1. Maturational-biological:
2. Environmental: Roe, Super
3. Interactionist:

II. Composite Picture of a "Normal" and a Deaf Adolescent

1. Perception of self
2. Perception of the world
3. Achievement motivation
4. Career orientation
5. Expected behavior

III. Sex, Ethnic, and Socioeconomic Differences

IV. Implications for Instruction and Guidance of Deaf Students

Section 1

Theories and Models

Section 1 will be organized into units corresponding to ways in which the psychology of the human organism has traditionally been divided for study: Cognitive/Learning, Language, Personality, Morality, and Vocational theories. Additionally, theories of Education that have relevance for the study of adolescence will be considered. Within each unit are found models that exemplify the biogenetic or maturational, the environmental or sociocultural, and interactionist, or those that posit some form of interaction between the developing organism and the environment. Table 1 summarizes this organization.

In discussing each model, we will begin with a brief general outline of the theory or model, then proceed to elaborate on those aspects of the theory that pertain to adolescence.

THEORIES and MODELS of HUMAN DEVELOPMENT

	Maturational-biological	Environmental	Interactionist
A. Philosophy			Lecky
B. Cognitive-Learning	Gesell Jensen	Pavlov Watson Skinner	Piaget
C. Language	Chomsky Lenneberg	Skinner Staats Luria	Bloom Cazden
D. Personality	Freud Hall	Mead Benedict Bandura-Walters	Erikson Havighurst
E. Morality			Kohlberg Maslow
F. Education	Montessori	Gagne	Cronbach-Snow
G. Vocational		Roe Super	

Lecky's Self-Consistency Theory

Lecky's (1951) theory is based on the premise that human behavior is usually "in character" because all the acts of an individual have the goal of maintaining the same structure of values (pp.81-82).

Lecky was reacting to the pervasive behaviorism of his day, which tended to study isolated pieces of behavior without reference to a theoretical underpinning that might provide a broader framework. Prediction of future behavior from this standpoint would rest solely on the frequency with which similar behavior had occurred and been reinforced in the past. Lecky rejected this notion categorically. A few quotations from his single work, Self-Consistency (1951) give the flavor of his position.

> While the study of character would of course be worthless unless it were based on carefully established facts, it is also apparent that the facts alone do not furnish their own illumination. The central scientific problem, therefore, is manifestly interpretation. . . . Mechanistic theory is itself an interpretation (p.99).

> The current definition of psychology as "the study of behavior" is as meaningless as a science of physics described as "the study of motion." What is meant, of course, is the behavior of organisms, but if the organism is the unit, and we study it descriptively, we thereby suppress the integral character of the behavior itself (pp.100-101).

For Lecky, then, the structure of the personality is a constellation of values, some of which are close to the core of the self, while others are more peripheral and more amenable to change. The total constellation changes over time -- more slowly and with more resistance at the center, more readily at the periphery. By selective perception and memory of those events that fit the value system, and by distortion or abandonment of those that do not, the personality is molded into a coherent unity of ideas, attitudes, values, and beliefs. Self-consistency is thus the overriding principle of personality formation.

Change is possible, however, through learning. Learning is problem solving, and the problem basically is the problem of assimilation. To use Lecky's own example, to the infant, food is a problem; it must begin with those foods that are easy to assimilate, and progress to a more varied diet by easy stages.

"In a word, the organism must learn to solve increasingly difficult problems of assimilation, and develops because it does solve them" (p.114). If learning is problem-solving, then the solutions achieved constitute the organism's preparation for the next task. The broader the preparation, the wider the variety of foods that can be used to maintain the organism in its normal state, and the greater its freedom of choice and action, since it is no longer dependent on certain kinds of food. But other learnings are also involved. The organism must also learn to defend itself against germs and bacteria, to adjust to changes in temperature, and in general, to live in the environment in which it finds itself. "Stability is a function of preparation" (p.114).

There is, of course, a strong parallel between Lecky's formulation and that of Piaget, who drew heavily on biology in developing his theory. The parallel becomes even more evident as Lecky elaborates on the learning process.

> Independence and freedom, insofar as they exist, are thus the organism's own achievement. Assistance can be given by protecting the child against problems too difficult for him, and by presenting new

> problems at the proper time, but the learning itself must be accomplished by the child. He must develop his own repertory of solutions. Since his preparation at any given time is limited, however, and his history marked by failures as well as by successes, the scope of his freedom is likely to be rather sharply defined. That is, he tends to select and avoid situations according to his estimate of his own abilities. On the basis of past experience, he predicts in advance whether new situations will be soluble or insoluble, and consequently, whether his organization will be strengthened or disturbed if he faces the problem.

As with Piaget, although the discussion started at the biological level with the assimilation of food, it moves quite naturally into the psychological field, since the mechanisms of assimilation (and in Piaget's case, accommodation) are the same. Together they constitute the individual's *adaptation* (Piaget's term) to his environment. Piaget would agree with Lecky that "learning begins with a problem which produces or threatens to produce an emergency state, and proceeds in the direction of a state of stability " (p.115), but the terminology would be slightly different. Piaget would say that some event (external or internal) disturbs the *equilibrium* of the organism, which "assimilates" those aspects of the event that fit the organism's *schemata* at the moment, as a result of which, *accommodation* (internal or behavioral) occurs, raising the organism to a new state of equilibrium. Thus, learning has taken place.

We also see how much both authors owe to the Gestalt psychologists' concept of "reorganization of the perceptual field."

Another interesting point made by Lecky is that learning also involves more economical use of the organism's resources. A performance that is being learned involves the activity of the whole organism (cf. the global undifferentiated body activity of the infant). After learning takes place, the activity becomes more differentiated and localized. In other words, efficiency as well as level of performance is an important ingredient of learning. Conversely, if mastery of the skill or task is accomplished, but the excessive activity continues, or an inordinate amount of time is consumed in the performance, according to Lecky, this signifies a failure in the learning. Of course, there are situations where even after learning has taken place, the organism for some reason resorts to "emergency behavior." "Logically, therefore, the evidence would indicate that the process is not mechanical " (as stimulus-response theory would hold), "but economic, a question of organic efficiency, cooperation, and division of labor. Problems must be solved to prevent the too-frequent appearance of emergency behavior, which would interfere with organic efficiency" (p.116).

Like other phenomenological theories, Lecky's is essentially humanistic, subjective, and individualistic. The organism is conceptualized not as a physical system whose behavior obeys the laws of mechanics, but as an organization with the psychological attributes of thinking, choosing, remembering, learning. Hence his explanation of certain psychological phenomena is different from the behavioristic interpretation. It may be remembered that, in a famous experiment, Pavlov subjected his dogs to a learning situation in which the animal was conditioned to respond to a circle but not to an oval. When the stimulus became ambiguous (the oval gradually became more circular), the animal's behavior changed abruptly. It began to jerk violently, squealing and biting the apparatus, even after it was removed to another room. This condition of acute neurosis often lasted several months.* Pavlov's explanation, of course, rests on the hypothesis that the conflicting processes of excitation and inhibition are induced simultaneously in the brain. Lecky points out the "curious fact" that the severity of the symptoms in such cases seems to be determined by the lack of expectation rather than by the shock itself. "The ability to foresee and predict environmental happenings, to understand the world one lives in and thus, to be able to anticipate events and prevent the necessity for sudden readjustments, is an absolute prerequisite for the maintenance of unity.... The apparent stability of the habit system is not to be interpreted as due to the fixation of pathways in the nervous system, but rather as the reflection of a stable system of values. It follows that to change the habits we must work on the values, not on the habits themselves " (p.122-3).

---

* Later experiments by Gantt, using sheep, showed that the same behavior can be evoked years later in some subjects simply by returning them to the experimental room.

Many of Lecky's statements have a contemporary ring, especially in the realm of changing ingrained social attitudes toward minorities and the handicapped. Such attitudes are often at the core of the personality organization to the point where they are a stable feature of the unconscious. It may be difficult even for people who want to change and are able to intellectualize their attitudes to change beliefs at this deep-seated level. By the same token it must be realized that persons who have been members of a minority group all their lives have their own internalized system of beliefs about the world, and their relationships to it, their ability to control it, etc. If reality is a construct, as Piaget maintains, we need to examine the construct of the particular individuals that are the object of scrutiny. If, as Lecky avers, all behavior is motivated by the need for unity, then we can begin to understand particular notives or actions as expressions of that main motive, and to see why behavior that appears deleterious or even self-destructive, is rational in terms of maintaining self-consistency.

Phenomenological theories concentrate on the present. The most important factor in psychological understanding is to perceive the world through the eyes of the individual at a given moment in time. Contained within the present, however, are the person's interpretation of past and future. The way the past is perceived has more bearing on subsequent behavior than the reinforcement history, for example; but it is the future that becomes particularly salient in a teleological theory such as Lecky's. In the case of the adolescent, we need to know about the motives, goals, and anxieties that characterize this period, both for understanding current behavior and for predicting the future. Self-consistency is the unifying principle that allows the future to be predicted with some degree of confidence from the present.

Douvan and Adelson (1966) conducted an extensive study to explore adolescent conceptions of future time and adulthood. The adolescent straddles the two worlds of childhood and adulthood. The metaphor most commonly used to depict this status is that of the bridge; however, it is in some ways inapt. Passage between the two worlds is not simple and unidirectional. There is a great deal of wavering and backtracking and general broadening of viewpoint as though the adolescent were trying to encompass both worlds in an overall perspective. Adulthood is not just a prospect that the child sees ahead; it is a crucial component of daily life permeating all thoughts and activities. A more appropriate metaphor than the bridge is the picture puzzle, the future being a crucial piece that is missing. "The color and content of the piece are missing, but the shape is established, and bears an intimate relationship to bordering pieces. If the piece is really crucial -- as the future is in adolescent identity --, the whole puzzle depends for its interpretation and meaning on what the piece will look like " (p.22).

There are, of course, many ways in which the adolescent may orient toward the future. Is the future concept more general than specific, painted in broad strokes with the details left to later determination, or is it over-specific in some particulars? Where does the young person sit on the important dimension of reality-fantasy? How coherent is the view of the future? These were some of the questions addressed by the Donvan and Adelson study.

Two types of questions were asked: first, direct questions about plans and expectations, existence of a life plan, types of occupational and educational decisions to be made; second, indirect questions designed to probe the less formulated aspects and emotional aspects of the image, questions about daydreams, the type of adult most admired, and so forth. Junior high school students were interviewed for this purpose.

A major finding cutting across all dimensions was that of sex differences. The authors had hypothesized that, because of the different roles assigned to the sexes in this culture, the identity problems posed for the two sexes would differ sharply. "The nature of his occupation plays a crucial defining role in a man's identity. The girl, on the other hand, depends on marriage for her critical defining element; she will take her self-definition, by and large, from the man she marries and the children she raises." (p.23). In assessing the findings, which did largely conform to this hypothesis, one must ask first, to what extent did the authors' expectations color their interpretation of the data, and second, whether there have been changes in girls' self-perceptions since 1966. Whatever the answer to these questions, the results of this particular study showed a central difference between boys and girls in their posture toward future time. Boys had a relatively extended time perspective, with a more or less coherent and developed notion of intervening steps, and a strong underpinning of motivation and commitment toward the desired goals. When the theme of achievement occurred in the girls' interviews, it usually related to the kind of man she would like to marry and her goals and aspirations for his work. Her own plans tended to be short range, to refer to the immediate future, the period of education and work that precedes marriage.

Another significant difference pertained to the degree of fantasy with which the future was invested. The occupational issue forms the core of masculine identity, and the adolescent boy can begin to choose and prepare for work. This activity lends itself to rational planning and specific preparation based on objective criteria. The girl faces a more ambiguous task, since marriage lies not in the immediate future but beyond it in some relatively undefined time. Moreover, there is the fact that the marital role is tied to the girl's sexual identity, and that she has had no experience (except vicariously through her mother) in the role. For these reasons, the authors believe, girls' notions about the future are heavily imbued with fantasy. There is a marked discontinuity between fantasy and realistic planning.*

---

*One may ask wehther boys' fantasies about their future occupational role may not be equally unrealistic. Take, for instance, the boy who wanted to be a dentist because "It's a great life. You just say to the nurse, 'Keep Thursday afternoon free, I'm playing golf.'" Or the boys who are failing high school graduation requirements, but insist they are going to be lawyers and doctors.

for example, girls' daydreams focus largely on physical beauty and glamor, but there is little realistic effort toward change.

Can the same be said of adolescent boys and girls in the 1980s? Have 15 years of women's liberation changed the feminine view of the future for a large proportion of adolescents? Does the prospect of being a husband and father enter into the boys' calculations more than it did in 1966? Studies are needed to answer these questions.

Cognitive-Intellectual

Maturational-Biological
Jensen's Genetic Theory

According to this theory, a person's level of intellectual ability is primarily a function of heredity. Environment is a factor, but only as a threshold variable, in the sense that unless the environment is severely restricted, changes in the environment will not affect development of the intellect appreciably.

Jensen hypothesizes two levels of learning ability. Level I, associative ability, involves both the automatic association of stimuli and responses in the lower cortex (classical conditioning) and learned associations. Digit memory, serial rote learning and paired-associate learning are included in this level of intellectual ability. Level II, conceptual ability, involves self-initiated transformation and elaboration of the stimulus material, such as occurs in concept learning and problem solving. Level II is the essential intelligence, the overall general factor of intellectual functioning.

Level I abilities appear to be evenly distributed across racial and social lines. By contrast, on Level II abilities, lower-class children's performance is significantly inferior. Jensen concludes that Level I is a necessary but not a sufficient condition of Level II, and that both abilities are required for successful school achievement. Since class differences are attributable to the hereditary factor, differences in educational attainment would seem to be unavoidable. However, all children should be taught by educational methods that maximize the intellectual abilities they have.

Gesell's Theory of Developmental Stages

Growth, both physical and mental, proceeds in a lawful, sequential fashion, bringing about changes both in form and function. It comes about as a result of forces inherent in the organism. The emergence of behaviors is determined by biological factors, and the ages at which particular skills emerge is highly predictable. All infants crawl before they walk, and babble before they utter words or formulate sentences, due to "powerful stabilizing factors, intrinsic rather than extrinsic, which preserve the balance of the total pattern and the direction of the growth trend. Maturation is, in a sense, a name for this regulatory mechanism" (1933, p. 232). Maturation is thus a prerequisite to learning. Given this premise, it follows that learning cannot be accelerated. "There is no conclusive evidence that practice and exercise even hasten the actual appearance of types of reaction like climbing and tower building. The time of appearance is fundamentally determined by the ripeness of neural structures" (1929, p. 1'4). Environmental factors simply stimulate, support, and in some cases modify growth.

Gesell's theory gives rise to a related concept, that of "readiness." For any performance, there is an opportune time when initial instruction should be introduced, if the child is to profit from tutoring and practice. The level of maturity at which the child will have the interest and ability to learn a new skill will vary, depending on the maturation of the neural pathways involved and the complexity of the skill itself. With maturation comes increased speed and precision, as well as increased muscular strength. Hence, any performance that relies heavily on one or more of these factors is unlikely to benefit from early instruction or premature practice.

Many studies were conducted to test Gesell's main hypothesis. Among the most important were the famous twin studies by Myrtle McGraw (1935), in which one twin was given specific instruction in various forms of physical activity such as climbing stairs, roller skating, and so forth, while the other was not. In general, the twin who did not receive instruction and practice rapidly reached the same level of performance once the requisite level of maturation had been reached. Her results further indicated that specific training may be given too early or too late to be effective, and that practice is definitely most productive when it is articulated with maturational level. In another study by Josephine Hilgard (1932), two-year-olds were encouraged to learn how to manipulate buttons and use scissors. After twelve weeks of such training, these children were superior to a group that had not had such assistance and encouragement. When the latter received training during the thirteenth week, however, they made rapid progress, and at the end of this one week of practice were as proficient as the experimental group.

Almost all the studies, of which the above two are representative, use very young subjects to examine the development of psychomotor variables, presumably because these variables are easier to observe and record, and because growth is more rapid in young children. It is interesting to note, however, that even in these studies it was revealed that, for some skills, maturation alone is not enough and that under certain conditions training can be advantageous. "Readiness" can refer to a much more complicated state than the development of neurons; in the case of reading readiness, for example, it includes interest and enthusiasm for reading, reasonably wide experience, ability to do elementary abstract thinking, a fairly wide vocabulary, ability to discriminate auditory and visual forms, and a degree of emotional stability and social adjustment. It is clear that for the greater part of the range of human behavior, learning involves far more than is implied by the term maturation.

By use of longitudinal studies and film-recording techniques, Gesell and Ilg (1949) were able to document the appearance of specific behavior patterns rather specifically. In the case of stair climbing, for example, a single pattern was observed in eleven of the twelve children studied. Such detailed developmental schedules also provided the rationale for infant intelligence tests, since norms can readily be obtained from the inventory of specific behaviors. While it was easier to be precise at the earlier age levels, Gesell was sufficiently confident in the universal applicability of the biological principle of maturation to extend his theory to cover the adolescent years. His theory of adolescence is an integral part of his general theory, presenting a continuous picture of development from birth to young adulthood. As in his earlier work, Gesell's biologically oriented theory of predetermined maturation describes a chronological sequence of behaviors that is essentially normative and "more or less characteristic of the human species" (Gesell and Ames, 1956, p. 22). His descriptions suggest that, in spite of individual differences, twelve-year-olds (for Example) will have specific common characteristics that differentiate them from eleven-year-olds or thirteen-year-olds.* Growth is thus a continuous process of emerging patterns. Yet it is a matter of common observation that progress is not continuous. Children give the impression of having acquired a skill, only to regress temporarily, before moving forward again. This much Gesell acknowledges. There is a principle of reciprocal interweaving at work, he asserts, that causes neuromuscular development to proceedd in a manner that is more adequately represented by a spiral than a straight line, thus accounting for the customary oscillations in behavior. Plateaus are a well-known phenomenon in the learning of complex skills such as typing for example. In the early stages of learning progress is rapid, but is followed by a levelling off and then further growth spurts punctuated by plateaus. These plateaus are usually explained in terms of the need to consolidate many newly acquired subskills into a continuous smooth performance. There is also the possibility that they coincide with a point at which the novelty is wearing off and interest is beginning to flag, especially as more demands are made on the learner.

Although plateaus and regressions are more easily demonstrated with the acquisition of simple motor skills, Gesell's concept of "growth gradient" applies equally to the swings of behavior observed in adolescence. This period is marked by well-defined stages of development in the advance toward more complex and mature forms of behavior. For Gesell, adolescence is a crucial transition period between childhood and adulthood, extending from the age of eleven to the early twenties. The more important changes occur in the first five years, which he calls the period of "youth." Like Erikson, Gesell believes that the adolescent's central task is to find an identity. The process is initiated by the biologically controlled changes in glandular secretion, the development of primary and secondary sex characteristics, and general changes in physique and musculature. The biological principle extends beyond physical growth, however, to include the development of cognitive abilities and even attitudes. Hence, the composite picture at each age includes physical, cognitive, affective and social aspects, as may be seen from the following synopsis:

---

*A caricature of Gesell's theory shows a five-year-old child mulling over a copy of The Child from Five to Ten and announcing gleefully, "Boy, what a stinker I'm gonna be when I'm six!"

The 10-year-old is at the apex of the childhood cycle. This is a period of stability and acceptance of life as it is. The child is confident and sociable. He enjoys family activities and peer relationships with equal zest. Rebellion and disaffection with parents have yet to appear. There is physical equilibrium accompanied by abundant energy and enthusiasm for group projects and team games. Learning proceeds apace. Although children at this age appreciate the relative nature of moral rules, they also have a strong sense of fairness, and demand equitable treatment from both adults and peers.

The 11-year-old, already moving into the cycle of adolescence, is quite diffeeent. The physiological changes beginning to take place are reflected in violent swings in behavior, in moodiness and episodes of rebelliousness and negativism which affect relationships with both family and friends.

The 12-year-old, shows a renewed balance. Much of the turbulent and unpredictable behavior has disappeared, giving way to more reasonable modes of response. Sociability and enthusiasm are restored, and tolerance and good humor characterize his interpersonal relations. The antipathy toward the opposite sex found at 10 is reversed; there is strong interest in mixed group activities.

The 13-year-old, by contrast has become introspective and self-critical, sensitive to the moods of others, but more critical of them than formerly He has fewer friends, but he is more selective and his relationships with them are more intense. He is now a "teen" and keenly aware of his adolescent status. This awareness is intensified by the dramatic bodily changes taking place, changes he may wish to accelerate and exaggerate or to conceal. Periods of self-confidence are punctuated by bouts of self-denial or despair.

The 14-year-old, in turn experiences a return of the old exuberance and self-confidence. This is a plateau year in which he consolidates his relationships with peers and, in general, begins to expand his interest in people. He is fascinated by different personalities, including his own, and is prepared to discuss such matters endlessly. Heroes and public figures claim his attention, and he speculates at length on their experiences and feelings.

The 15-year-old, is beginning to show signs of the individual identity that will mark the culmination of the adolescent cycle. He can no longer be "readily summed up in a simple formula" (Gesell and Ames, 1956, p.214). His relatively consistent behavior is interspersed with rebellious episodes but these are more attributable to a growing spirit of independence than to unpredictable mood changes. He may be a perfectionist (cf.Erikson), but he applies these standards to himself as well as others. Because of his increased awareness of people and events, there is a greater potential for him to be led by others into good works or into delinquency.

Together with his growing feelings of independence, this potential may result in precipitous actions such as running away from home or dropping out of school, actions which may lead to irreversible consequences that are later regretted.

The 16-year-old, has come a long way on the road to maturity. He has the self-control and self-confidence of an adult, is socially well-adjusted and independent. Rebellion is a thing of the past. The search for identity has progressed to the point where the youth is focussing on a future occupation and, in some cases, marriage plans. Relationships between the sexes are on a more comfortable basis than in the earlier years. Although the adolescent period extends into the twenties, the major changes have been completed, and the remaining years are devoted to playing out the scenarios already established during the period of youth. Hence, the yearly normative descriptions are no longer provided by Gesell beyond the sixteenth year.

Although Gesell emphasizes "continuity of the growth cycle," the above descriptions are remarkable for the contrast between children only one year apart. His adoption of the spiral model of development seems to have predisposed him to exaggerate these contrasts in an effort to emphasize the cyclical nature of growth. In so doing, he underestimates the range of individual differences at any given age, as well as the improbability that developmental changes will fit neatly into a schedule based on the calendar year.

Nevertheless, there are implications to be drawn from his theorizing. The spiral model probably has some validity and, indeed, is used by other theorists such as Erikson to explain recurring behavioral phenomena. Gesell believed his theory to have "Vast social implications -- implications for child guidance, for mental diagnosis, for health supervision, for the conduct of education, and for the very arrangements of our ways of living (1948, p.10). An obvious implication is that the school curriculum at any level should be based on the psychology of development. It was his hope that the laws of learning would "be reformulated in terms of the biology and physiology of development"(1946, p.298). The teacher and curriculum developer must have precise knowledge of the schedule of development for every skill or behavior pattern to be taught, since instruction and practice that are introduced too early or too late are either ineffective or possibly harmful. (At the very least they take up time that could be used more profitably.) Disciples of Gesell were fond of using the analogy of the bee pollinating a flower. There is a narrow period of time within which this possible. "Learning" is almost entirely a matter of maturation. This argument represents the extreme position on the "maturation" end of a theoretical continium. At the opposite pole would be found a doctrine akin to the Bruner postulate that any subject may be taught at some level at any age. The truth probably lies somewhere between these two extremes. However, Gesell's theory has been very influential in counterbalancing the dominance of behaviorism in America, and is in the direct tradition of maturational theorists from Rousseau to Chomsky and Piaget.

Interactionist

Piaget's Genetic Epistemology

For Piaget, the growth of intelligence is a matter of adaptation to the changing environment. Adaptation consists of two complementary processes: assimilation and accommodation. Piaget seems to view assimilation in very much the same way as the Gestalt psychologists. The organism takes in those kinds of material (food, information, etc.) for which it is biologically suited; but the amount and the way in which the material is assimilated depends on the structures with which it is currently equipped. In the intellectual sphere, these structures consist of schemata, and these schemata develop and become both broader and more differentiated as the person grows. The infant, for example, has a very vague, yet global schema of food; with experience this schema will become highly complex.

Growth in intelligence is continuous but the qualitative changes are so great that it is possible to discern maturational stages, which are rather broad, subject to individual differences in attainment, yet universal in their application and invariant in sequence.

Sensorimotor period (0-2 years). Intelligence at this stage consists of coordinating motor responses to external and internal stimulation. Building on the reflexes present at birth, the infant develops various schemata of looking, grasping, etc., which become coordinated into complex responses. The most significant learning that takes place during this period is the understanding of object permanence.

Preoperational period (2-7 years). Once the child has realized that objects continue to exist when they are out of sight and hearing, it becomes possible to substitute for them in thought and action by the use of symbolic representation. The child's use of signifiers to stand for other objects and events is seen in imaginative play. The advent of language provides the child with a much broader repertoire of signifiers and frees the child from the need for immediate concrete experience in order to think about an object.

The major characteristic of this period is egocentrism, by which is meant the inability to "decenter," that is to move outside one's frame of reference (perceptual or experiential). The concept of egocentrism led Piaget to develop a series of famous "conservation" experiments (the "mountain" test, the "balls of clay" and "beakers" tasks, among others) showing the young child's inability to relinquish a particular perspective and to reason about changes (or lack of changes) that must *of necessity* have taken place in changing that perspective. Egocentrism is also manifest in the child's beliefs about the nature of the physical world and human omnipotence with respect to natural phenomena.

Although egocentrism is a characteristic that is found primarily during the preoperational period, psychologists are coming to realize increasingly that it may also be found in adolescence and adulthood. In times of stress when personal values are threatened, or simply due to lack of socialization in certain spheres of inquiry, on certain topics of discussion, the adult may display an egocentrism not unlike that of the preschooler.

Concrete operational period (7 - 11 years). As the child emerges from the preoperational period, certain skills (or more accurately, modes of thought) become apparent: the ability to order objects on a given dimension such as length, to classify and subclassify objects on one, two, and three qualities, to conserve number and quantity in spite of physical manipulations, to reason about cause and effect in the natural world, and eventually, in the psychological realm. The use of language to represent events is now broadened by the ability to read and write, thus enabling the child to learn from vicarious, as well as immediate experience.

"Operations," in Piaget's terminology, refers to the ability to perform intellectual operations on data, to reason about their relationships. The chief limitation at the concrete-operational stage is that the child must have the objects present in order to perform these operations. Manipulation in thought comes only at the formal operational level.

Muuss (1975) summarizes the four concrete-operational groupings described by Piaget as follows:

> 1. Combinativity. Two or more classes may be combined into a single all-inclusive class, e.g., boys and girls = children. This operation also leads to the realization that the class of children must be larger than the class of boys or girls taken separately.
>
> 2. Reversibility. Every logical or mathematical operation is reversible. The class of children may be broken down again into boys and girls. Moreover, children minus boys = girls, and children minus girls = boys. Reversibility is an important index of the child's maturity of thought.
>
> 3. Associativity. This operation enables the child to adopt diverse routes to the same goal. If asked to assembly 13 balls of different colors, for example, the child realizes that there are many combinations that satisfy the requirement.
>
> 4. Identity or nullifiability. An operation combined with its opposite becomes nullified, e.g., driving one mile west followed by one mile east returns one to the point of origin.

Formal operational period (11-15 years). This is the final stage of cognitive development culminating in the ability to use all the intellectual operations of the adult. In contrast to the necessity for immediate experience of the concrete operational period, formal operations are characterized by hypothetical and deductive reasoning. Using propositions instead of objects, the adolescent analyzes a problem and hypothesizes several possible outcomes without acting on any of them. Possibility and probability, as well as reality, assume importance. The reasoning is abstract and logical, hence it can be checked for validity, in addition to being tested against reality. Abstractions are built on abstractions, and operations performed on operations.

As previously noted, since growth is dependent on the assimilation of, and the accommodation to experience, it is necessarily slow and gradual. The child does not move abruptly from one stage into the next. Similarly, at either end of any particular stage the child is more likely to resemble a child in the immediately adjacent stage. At the beginning of the formal-operational period, between the ages of 11 and 13, for example, the preadolescent is in transition. It is during the next two years that the adolescent's thinking approximates that of the adult. Hence it is possible to discern two distinct stages within the formal operations period in which the mind undergoes reorganization.

Another consequence of the gradual nature of intellectual development and its dependence on experience is found in the fact that formal operations may never be reached by some poeple in certain areas. Growth comes about when new experiences or new information upset the person's mental equilibrium. If the new information is too alien to the person's experience or beyond comprehension, it will, of course, be ignored and thus will not upset the equilibrium. Typically, however, new information does set up a stage of disequilibrium, which will persist until, through assimilation and accommodation, a new level of equilibrium is reached. According to Piaget, a primary stimulus for disequilibrium is to be found in the conversation of peers who challenge the child's prevailing viewpoint. These socializing experiences are critical to the development of operational thought at each successive stage. An important corollary of this principle is that the adolescent's peer groups will have a profound effect on the particular directions intellectual development will take.

An important concept in Piaget's theory is that of *décalage*. He distinguishes two kinds, horizontal and vertical *decalage*. Vertical *décalage* refers to the fact that an individual may return at different times in the lifespan to the same problem, but will use different strategies and modes of thought to address it, a phenomenon also noted in Erickson's theory. Horizontal *décalage* reflects varying levels of experience in different areas; for example, the concrete-operational child at a particular time may have acquired the concepts of conservation but not that of classification or may understand the conservation of number, but not of quantity.

Similarly, at the formal-operational level, there is increasing differentiation of mental abilities (Elkind, 1971, pp.122-123). Both personal interests and the increased specialization of the secondary school curriculum contribute to this differentiation.

Egocentrism in adolescence. In his paper by this title, Elkind (1967) discusses the unique form that egocentrism takes at each stage of development. Each stage is treated as being primarily concerned with one major cognitive task. The major cognitive task of infancy is "the conquest of the object," and the egocentrism of this stage is seen as the difficulty in differentiating between the object itself and the experience of the object. During the preschool period, the major cognitive task is "the conquest of the symbol," and the egocentrism of this period consists in a lack of differentiation between symbol and referent. With the emergence of concrete operations, the task is that of "mastering classes, relations, and quantities," and here it is the "inability to differentiate clearly between mental constructions and perceptual givens" which constitutes the egocentrism of middle childhood.

The major cognitive task of early adolescence is "the conquest of thought." "Formal operational thought not only enables the adolescent to conceptualize his thought, it also permits him to conceptualize the thought of other people ... (this is) the crux of adolescent egocentrism." (Muuss, p.43). The adolescent comes to believe that other people are as preoccupied with his appearance and behavior as he is. This belief leads to the anticipation of others' reactions and to the construction of an imaginary audience that reflects his current feelings about himself. The preoccupation with self also leads to "the personal fable," the belief that one's own feelings and experiences are unique in their intensity. Examples abound that illustrate "how adolescent egocentrism, as manifested in the imaginary audience and in the personal fable, can help provide a rationale for some adolescent behavior," and can also provide "a useful starting point for any attempt to reconcile cognitive structure and the dynamics of personality."

Again, it is social experience that modifies (though may not entirely dispel) these elements of egocentric thought. The adolescent comes to realize that members of the peer group are similarly preoccupied with their own fantasies. Still, as Looft (1971, p.490) points out, remnants of the personal fable may persist or "go underground"; the adolescent "understands the fallacy of the theory of uniqueness, but affectively continues to derive enjoyment from it in imagination."

It is perhaps, the preoccupation with self that leads the young person to question the basic meaning and value of human existence. The capacity for abstract thought leads to idealism and euphoria alternating with periods of despair and cynicism. Concern with national and global problems leads to comparisons of what could be with what is, and to an impatience with imperfections of the social world adults have created and seem unable or unwilling to change. Political leaders have long recognized the value of harnessing the idealism and energy of youth to particular causes. "The capacity for engagement in meaningful social activity is clearly present in young people in every country of the world. The challenge to the behavioral scientist is to help his own country develop the forms and means to enable the adolescent to take a leading role in the struggle for the attainment of a world in which peace, freedom, and economic opportunity are omnipresent" (Eisenberg, 1965).

In 1966, Jerome Bruner challenged the Piagetian interpretation of findings related to the conservation experiments, pointing out that the format of the problem or the language in which it is couched may be directly responsible for immature performance, rather than the lack of reasoning ability as Piaget hypothesizes. Donaldson (1978) has reiterated this argument, citing many recent studies to bolster her contention. Most of these studies refer to the transition from preoperational to concrete-operational thought; however, the same argument, if valid, would apply at other levels. For example, Donaldson cites a study by Wason and Johnson-Laird (1972) in which adults were given two versions of a task, one using highly abstract symbols, the other using familiar materials. Their conclusion was that a rule that "proved so recalcitrant when its terms and conditions were arbitrary has become trivially easy when it is embodied in a real task" (p. 81). Similarly, Kuhn, Ho and Adams (1979) raise a basic issue in the assessment of formal reasoning: "To what extent does the absence of a formal-operational level of performance reflect genuine absence of the underlying reasoning competencies, as opposed to difficulties in dealing with the format in terms of which these competencies are being assessed?" (p. 1133). This question is especially critical in relation to the diagnosis of deaf students' abilities as well as in terms of the most appropriate formats for the presentation of curricular materials.

D. Personality Theories

Hall's Biogenetic Theory

Prior to 1900, theories of human development were based on philosophical thought, religious beliefs or personal experience. The child was viewed as a miniature adult, hence there was no differentation between childhood and adolescence. Growth was conceived as continuous and quantitative.

Darwin's work on evolution has been cited as the single most important force in establishing child psychology as a scientific discipline (Mussen, Conger, and Kagan, 1974), and was unquestionably the immediate forerunner to the first systematic theory on child development, that of G. Stanley Hall. Hall's classic book on adolescence, appearing in 1904, was the first to draw a significant distinction between childhood and adolescence. In accordance with his theory of recapitulation, which states that each human being relives the stages of man's evolution, Hall viewed adolescence as the transition between the primitive ancestral child and the civilized man, a period dominated by emotional storm and stress that finally gave way to the emerging rationality of adulthood. In this sense, Hall's is a stage theory. In fact, given the predetermined maturational unfolding that is their cornerstone, biogenetic theories tend of necessity to be stage theories. The same phenomenon may be observed, regardless of the content area, as for example, in biologically based theories of language development. The converse, however, is not necessarily true. Theories that are not biogenetic, that tend to place greater emphasis on environmental than on biological factors may or may not be stage theories.

Hence a corollary of Hall's theory of recapitulation in his concept of stages of human development. The first stage of infancy re-enacts the animal stage of the human race. Childhood corresponds to the cultural epoch when hunting and fishing were primary activities as reflected in the games of children 4 to 8 years old. Youth (8 - 12) reflects a more recent era of savagery. Adolescence, the period extending from puberty to adulthood, is dominated by the emotional life, corresponding to a time when the human race was in a turbulent stage of transition from savagery to civilization. It is characterized by "Sturm und Drang" (storm and stress). The adolescent runs the gamut of emotions, oscillating between a high level of energy and exuberance and the depths of lethargy and despair. Selfishness and altruism are found in the same person, as are vanity and self-deprecation. The adolescent craves solitude while yearning for love and friendship.

Hall assumed that development was brought about by physiological factors that were genetically determined. The sequence occurs in a universal and unchangeable pattern, which is largely unaffected by environmental factors. The inevitability of undesirable behavior calls for acceptance and tolerance on the part of parents and teachers. Corrective measures are of no avail. Only time and maturation can correct this situation. Permissiveness and leniency are the order of the day.

Hall's formulations came to be viewed as extreme, and a considerable accumulation of evidence testifying to the importance of socio-cultural factors caused his theory to fall into decline. Nevertheless, Hall's work gives us the first flesh-and-blood picture of the adolescent in contemporary psychology.

Freud's Psychoanalytic Theory

Like Hall and Gesell, Freud emphasized that human development is essentially biological, consisting of a series of five biologically determined stages that extend from birth to adolescence. Adult personality is largely determined by the strength of certain innate drives or instincts, and the ways in which the individual by dint of experience learns to cope with these drives in socially acceptable ways. Much of this learning (and hence the blueprint for adult personality) is accomplished during the first five years. In cases where the instincts are extremely demanding or the social restrictions repressive, inner conflict, often at the unconscious level, may ensue.

Oral Stage (0 - 1 year). The basic drive is to obtain nourishment and hence pleasure through the mouth. Satisfaction of this universal need leads not only to immediate contentment on the part of the infant, but to long-term security and an optimistic disposition. Thwarting of the instinct, by contrast, leads to anxiety and frustration and to later manifestations of distrust and insecurity.

Anal Stage (2 - 3 years). Primary gratification at this stage is experienced by eliminating or withholding feces. The child's ability to control his sphincter muscles is met with a corresponding social expectation that he will become toilet trained. The ensuing struggle between the child's growing autonomy and interest in his body and parental demands for self-control carries the potential for internal conflict and subsequent personality disorders.

Phallic Stage (4 - 5 years). This stage is characterized by erotic self-stimulation of the genital organs. These preliminary sexual stirrings focus attention on the opposite-sex parent as a love object. In the case of boys, competition and rivalry with the father for the mother's love is known as the Oedipus Complex. It is followed by the castration complex or anxiety that the father, being infinitely more powerful, will avenge this usurpation by cutting off the little boy's penis. This anxiety becomes so overwhelming that the boy abandons the desired love object and begins to identify with his father, thus resolving the Oedipal conflict.

For the girl, the Oedipal situation is somewhat different. In her case, the development of penis envy leads to hostility and resentment to the mother (why?), and hence to a transfer to the father as a suitable love object. (The reasoning here seems to be that) since the mother is less powerful (or less vindictive?) and hence the girl does not experience castration anxiety, there is not the same compulsion to abandon the love object, and the girl's attachment to her father may continue indefinitely.

The universality of the Oedipus Complex has been generally accepted, though some anthropological evidence (Malinowski, 1927, 1961) suggests that the phenomenon is more culturally than biologically determined. More recently, the mother's long-erm role in her daughter's search for identity, which was ignored by Freud, has been systematically explored (Friday, 1977).

Latency Stage (6 - 12 years). Between 6 and 10 or 11, the child enters a period of relative calm in which the libido is not active and psychic energy is focussed on social concerns. The ego, as a mediator between libidinal demands and social regulations is dominant. Peer groups assume greater importance, and activities are pursued with companions of the same sex.

Genital Stage (13 - 18 years). The onset of puberty sees a reawakening of libidinal interest. Sexuality now assumes its adult form, and the adolescent seeks new sources of gratification. Muuss (1968) suggests that adolescent sexuality manifest itself in three ways: (1) through external stimulation of the erogenous zones; (2) through internal tension and physiological need to release sexual products (a condition not present in childhood sexuality); and (3) through psychological "sexual excitation" which may be influcenced by the two former manifestations of sexuality. (Thornburg, 1975, p.27).

The surge of sexual energy at this time is tied to aspects of physical maturation. The development of genital organs and production by the endocrine system of high levels of sex hormones, predispose the adolescent to notice and to seek out forms of sexual stimulation that are readily available in this culture.

As in early childhood, the libidinal drive in its renewed strength may find itself in direct conflict with societal mores. Problems that were poorly resolved at the earlier stage may recur, or new tensions may arise as the adolescent attempts to cope with burgeoning maturity, strong feelings, and parental or societal attitudes.

Environmental

Mead's Cultural Theory

The first major challenge to Hall's storm-and-stress theory came from Margaret Mead, a cultural anthropologist, who studied adolescent behavior in Samoa and New Guinea (Mead, 1925, 1935). Finding an absence of stress in adolescence in some primitive cultures she was led to conclude that stress is a function of cultural rather than maturational factors. Stress is caused by the fact that prolonged education and prolonged dependence reduce choices for adolescents just at the point where they feel that adult privileges are warranted. The conflict induced by these opposing forces may, in fact, interfere with the attainment of maturity.

Another concept drawn from crosscultural studies which may be useful in looking at adolescence is that of discontinuity. This refers to the abruptness with which the transition from childhood to adulthood occurs. In some cultures, puberty rites may constitute in a single ceremony a well-marked discontinuity in social status, duties, responsibilities, and privileges. Continuity of cultural conditioning is the rule in Western societies where gradual training for independence and responsibility starts in early childhood. It is interesting to note that discontinuity does not imply stress at adolescence, nor continuity lack of stress. Continuity and discontiuity have been extensively explored in a broad variety of cultures by Ruth Benedict (1950, 1954), as well as their implications for self-concept and social adaptation.

The Issue of Continuity vs. Discontinuity

Is development continuous or does it proceed in a series of well-defined stages? Starting with Hall, biological-maturational theorists tended to incorporate the notion of stages in some form, whereas theories of cultural relativism or those that emphasized the importance of the environment tended to be more impressed by the continuity of development. For Hall, development is "saltatory," that is to say, new, previously nonexistent functions come into being at adolescence, and other psychic functions undergo reconstruction to the point where "every trait and faculty is liable to exaggeration and excess" (1916, p.xiii-vix). *Margaret Mead and Ruth Benedict were among the first to discount the notion of necessary stages such as the period of storm-and-stress posited by Hall. Even more adamant in this respect was Leta Hollingworth, who was strongly influenced by the earlier works of cultural anthropologists. In her book, The Psychology of Adolescence (1928), Hollingworth emphasized the idea of continuity and the gradual nature of the changes that occur in adolescence. "The child grows by imperceptible degrees into the adolescent, and the adolescent turns by gradual degrees into the adult" (p.1). She attacked Hall directly. "The quality of the organism is a constant, which shows itself from the beginning to the end of the individual life . . . This widespread myth that every child is a changeling, who at puberty comes forth as a different personality, is doubtless a survival in folklore of the ceremonial rebirth, which constituted the formal initiation of our savage ancestors into manhood and womanhood" (p.16-17). This is a clear reference to Hall's doctrine of recapitulation. However, it is the question of continuity, not recapitulation, that is of interest here. Hollingworth's position was that the appearance of sudden changes in social status accorded the adolescent through various initiation rites has confused us into thinking they reflect some biological or maturational change in the organism. The opposite view, of course, would be that the various forms of puberty rites simply acknowledge or reinforce the biological givens of physical maturation. Hollingworth thus went further than either Mead or Benedict in rejecting the discontinuity hypothesis. Benedict, for example, although maintaining that development is gradual and continuous by nature, believed that stages can be culturally induced by discontinuities in child-rearing methods or educational practice. Mead, as we have seen, undertook her studies in New Guinea not to show that the discontinuities of American adolescence did not exist, but to demonstrate that they were a function of the culture rather than a necessary accompaniment of growth. Interestingly enough, in her later writings, Mead tended to give more credit to biogenetic inheritance as a determining factor in human development than she did in Coming of Age in Samoa and other earlier publications (Muuss, 1968, p.80). She was forced to this conclusion to some extent by the finding, among highly inbred and isolated groups with uniform patterns of child-rearing, of "remarkable differences in physique and apparent temperament" (1949, p.133). In fact, cultural anthropology as a field has moved away

---

* Of course, there is no necessary connection between biological-maturational and stage-discontinuity theories on the one hand or environmental and continuity theories on the other. In fact, the two issues could, in principle, be completely independent.

from its earlier position of cultural relativism to a broader theoretical position that incorporates biogenetic factors. In the course of these changes, Hollingworth's theory has also come under attack as underestimating the potential for radical changes of personality in adolescence (Allport, 1937, p.209).

In recent years, stage theories have enjoyed a new degree of almost universal acceptance. The decline of behaviorism, which had dominated the American psychological scence for nearly half a century, led to a resurgence of interest in aspects of human behavior that are tied to biological inheritance and hence are universal in nature. Chomsky and Lenneberg see the acquisition of language as following some prescribed pattern based on the unique neurological potential of the human brain. Piaget views the growth of intelligence as following the same biological laws of assimilation and accommodation as the physical organism; and Erikson, building on Freud's biological model of the personality, has elaborated the latter's concept of stages to incorporate environmental and cultural factors. In brief, we may say that the theories covering every aspect of development that are influential today are those that emphasize discontinuity. Whether this discontinuity is seen as an inevitable and necessary concomitant of the stages seems to be a matter of the particular theory. Piaget seems to be saying that the discontinuity between concrete and formal operations is unavoidable, inasmuch as younger children are incapable of using higher modes of thought until their intellectual powers have sufficiently matured, and that this can only happen as a result of vast amounts of appropriate experience. Erikson, on the other hand, while acknowledging that adolescence is a unique and dramatic period in the lifespan of the individual, might be inclined to say that this fact stems from the particular nature of the cultural pressures to which the adolescent is subjected in this society. And this stance would seem to be the one that is generally accepted today. In brief, on the continuity-discontinuity issue, we may conclude that the broad sweep of human development proceeds in a gradual and continuous manner, but that nevertheless pressures or other factors induced by the culture or the special circumstances in which an individual finds himself may cause major or minor discontinuities that could have lasting effects.

A corollary question is whether continuity and discontinuity are beneficial or detrimental in their effects on development. Again, we may suspect the answer lies somewhere in the middle. Discontinuities that are too sudden or too severe may have extremely harmful consequences, especially if they occur in the earlier years of childhood, or immediately following a long uninterrupted period of continuity. On the other hand, the introduction of some kind of discontinuity in the form of a change in educational method, or a shift in the psychological basis of the child's interpersonal relations with significant members of his immediate circle, may provide the very stimulus that is needed to propel him to the next level of development. This seems to be what Piaget is advocating when he suggests that maximum growth and learning take place when the mind is forced into a state of disequilibrium by the presentation of stimuli that cannot be readily assimilated without some reorganization of the existing schemata.

In view of the indisputable range of individual differences among children, it seems safe to hypothesize that what constitutes an "acceptable" instance of discontinuity will depend first on the mental state of the child at any given time, and second on the life history of discontinuities to which he has been subjected. If a child is accustomed to frequest and abrupt discontinuities, one more may be taken instride; on the other hand, it may be "the straw that breaks the camel's back." This means that adults who have control over what happens to him, must exercise astute clinical judgment and sensitivity to the child's individual needs in making decisions about inducing some form of discontinuity such as changing the school or sending the child to a foster home.

Discontinuties in the Life of the Deaf Student

In general, handicapped students are more liable to experience discontinuities in their lives and are less well equipped to cope with them. In the case of the deaf person, the history of discontinuity begins in early childhood. If the child is not born deaf, development will probably proceed on a normal course during the first critical years. The child will learn about object constancies and the rhythms and regularities of daily events. He will establish a basis of trust in his interpersonal relations. He may also acquire a fair degree of langugage through which he can communicate with others. With the onset of deafness, everything changes. The parents have a hard time assimilating this traumatic event, and their behavior toward the child undergoes drastic modifications. It may become rejecting or oversolicitous. Meanwhile, the child is trying to cope with the discontinuities in his perceptual world. He can no longer hear the sounds he previously heard. When he tries to communicate, he cannot hear the responses to his questions and comments. Gradually, through lack of auditory feedback, his own verbal ability begins to decline, and he becomes less comprehensible to others, thus increasing his frustration.

If the child is born deaf, it may appear as though some of these discontinuities will be avoided, and this may be the case. However, in many cases, a long period elapses before the parents become aware that their child is deaf, and when they do realize this unpleasant fact, the same pattern of rejection and disbelief or overprotection may ensue. In these circumstances, the child may not even have received the experiences needed to establish the most basic cognitive and affective foundation for later learning, as was the case with the child who becomes deaf adventitiously.

Sooner or later, the parents must make the monumental decision regarding the type of education they wish their deaf child to receive. Admission to a residential school may represent a form of severe discontinuity, especially if the child has not established trust, autonomy, and inititative. On the other hand, attendance at a regular day school may offer a sharp contrast to the home in activities and people, especially if he has been sheltered by the family for the greater part of his previous existence. Often parents, in desperation, switch from one form of education or treatment to another without adequate assessment of the effects of these changes on the child, irrespective of the merits of the treatment itself.

By the time he reaches the age of high school and college, the deaf child may have experienced many more forms of discontinuity than his hearing counterpart. On the other hand, he is expected to face the same developmental tasks as everyone else (the expectations may be somewhat modified, but the tasks themselves are essentially the same), while having fewer resources at his disposal and greater impediments with which to contend. It would not be too surprising to find the deaf youth totally ill-prepared to deal with the developmental tasks of adolescence with which hearing persons themselves have so many problems. Lack of experience may exacerbate the difficulties inherent in the task of distinguishing between fantasy and reality, especially since the "reality" of the deaf person's potential is not readily discernible even to a trained and objective observer. The process of coming to terms with himself, his abilities and desires, in short of establishing a workable identity, may be much more difficult and protracted than is usually the case with the non-handicapped. There is also the opposite danger that the process may not be difficult enough, that the deaf person may underestimate himself, be willing to settle for too little, rather than engage in the painful struggle of carving out an active and meaningful life for himself.

Quigley (1974) points out that, whereas the proportion of college attendance among the hearing rose 50 per cent in the decade from 1960 to 1970, the college population of deaf students in all types of institutions of higher education quadrupled during the same period. The demands for less restrictive admission requirements by minority groups seeking economic and social justice produced increased resources and programs for students who formerly had no chance of being admitted to college. The benefits of changed admission policies and attitudes on the part of university administrations extended to other minority groups, including the deaf. Hence, if going to college is a disruptive experience for the deaf adolescent, we must keep in mind that there are also more of them facing it than formerly. The development of higher education programs for deaf students has produced greater choices than formerly in the range of educational alternatives available to them. Although, as Quigley, Jenné and Phillips (1968) point out, a system of specialized facilities and programs for a small population can never duplicate the vast array of educational opportunities available to the general population, it must be recognized that a sudden increase in the range of choices both for the group as a whole and for individual members can create relative discontinuity and confusion, especially where the new programs themselves are radical in approach or not grafted on to the prevailing culture. It would seem that improvement in the range of choices must be accompanied by superior orientation and counseling programs.

Parallel to the increased educational programs, however, has come a restriction in the range of vocational opportunities for deaf persons. McCay Vernon has listed among the crises* of the deaf the alarming increase in unemployment, the elimination of many unskilled and skilled jobs through automation, and the overall shift in the world of work to white collar jobs in industry. These trends, he argues, point to the need for more work adjustment programs that embody a treatment process utilizing aspects of work to modify behavior (Hoffman, 1972). The Work Adjustment Project at the University of Minnesota has defined work adjustment as a "function of the degree of correspondence (agreement) between an individual and his work environments." The individual brings to the workplace certain occupational skills and preferences, while the job carries certain ability requirements and opportunities for specific forms of reinforcement. The level of correspondence between the abilities of the individual and the ability requirements of the job is referred to as *satisfactoriness.* The level of correspondence between the individual's needs and preferences and the reinforcing systems of the job is referred to as *satisfaction*. Both satisfactoriness and satisfaction are prerequisite to occupational success. This definition, while providing a tentative frame of reference, gives rise to several interesting and important questions.

---

* Vernon, of course, is using the term "crisis" in the usual, not the Eriksonian sense.

1. With appropriate abilities for certain specific jobs, can the individual communicate his capacity successfully enough to be judged satisfactory, as he should, or does special provision need to be made?

2. If the job reinforcers (satisfiers) match the individual's psychological needs, will they be perceived by the individual, or does some tailoring of the administration of rewards need to be done, so that they will be perceived and the deaf worker will be satisfied with the job? (Lofquist, 1970)

Vernon maintains that, although the central problem in deaf people's work adjustment is communication, the deaf person's education is, in most instances, a greater disability than his deafness. Whatever the merits of this statement, a study by Adler in 1970 indicated that the vocational development of deaf adolescents differs from that of hearing adolescents. Using a modified version of the Career Pattern Study developed by Super, the study suggested that existing programs for training and orientation to work have little impact on deaf adolescents. It is interesting to speculate whether the reason might be that deaf adolescents are preoccupied with the crises characteristic of earlier Eriksonian stages, and thus ill-prepared to assimilate information relevent to the task of establishing an occupational identity. Some credence may be given to this supposition by Burke's observation (1969) that "the vocational rehabilitation program will uncover a number of hard-core emotional problems that call for solution before case services can become effective. The goal of the program, he states, is for deaf clients to develop a deeper awareness of themselves and their impact on other people, as well as a better insight into their own feelings about their relationships with the hearing population.

For the above reasons, counseling with the deaf has come to be defined as process designed to help the clients accomplish the developmental tasks of the hearing and to prepare them for a more satisfactory adjustment to life through productive activity (cf. Erikson's patters of industry). The problems cannot be solved by the giving of occupational information or the administration of tests. Some type of *reconstruction of relevant areas of the personality* appears to be required (Neff, 1968, italics added). Erikson's theory of the successive acquisition of dimensions of social interaction would appear to be helpful in suggesting what these relevant personality dimensions might be. As Ann Glass (1974) points out, in the case of many deaf persons, it is habilitation that is required, because they are not to be restored but started on their way to maximum social, emotional, and vocational functioning. Reverting to Lofquist's second question, however, it must be reiterated that the individual's perception of himself and his level of functioning is equally critical. During the initial attempts to establish vocational identity, some role diffusion will normally exist. Adolescents at this stage normally over-identify with movie heroes, group leaders, athletic champions, and so on, even to the point of losing their own identity. At this point, he rarely identifies with his parents, since the task is to separate his identity from theirs. However, there is desperate need for social belonging. The peer group, the clique, or the gang help the adolescent to find his own ideal within a social context. He is willing to submerge his identity in that of the group and to accept almost total submission to its values and mores as a "necessary defense" against the dangers of self-diffusion. For the deaf adolescent, whether he chooses to identify exclusively with his deaf peers or with the larger world of all adolescents could have a profound effect on long-range development, and especially upon the merging of the ideal and the real which appears to be a prerequisite to successful work adjustment.

Erikson's Psychosocial Theory

Early psychoanalytic theory was built on the insights gained by Freud in the course of his clinical practice with neurotic patients, and thus tended to concentrate on the disturbed rather than the normal personality, and to overemphasize the individual and his relationships with his immediate family, while neglecting the role of the larger society. For these reasons, psychoanalytic theory came under heavy criticism, especially from sociologists, who viewed the impact of the culture as predominant in personality formation.

Erickson's contributions to psychoanalytic theory, while firmly based on Freudian principles, have done much to meet these criticisms. Two major modifications of the basic theory deserve special attention. First, by extending the development of personality through the duration of the lifespan, Erikson has provided a correction for the Freudian overemphasis on early childhood experiences. Second, by elevating the ego into greater prominence relative to the id and superego, he has made the healthy personality the focus of attention, in sharp contrast to Freud's extrapolations to normal persons from the study of neurotics. Moreover, both these modifications provide the interface of the individual with society that was sadly lacking in the original theory. In fact, Erikson's own work with the Sioux and Yurok Indian tribes, carried out in the best anthropological tradition, and his later studies of Gandhi and Martin Luther which introduce the new wave of psychohistory, are in the mainstream of American social thought of this century, and reveal a sensitivity to the alienation and uprootedness that have become basic concepts in contemporary sociological theory.

Erikson's theory is epigenetic in the sense that it conceives the healthy ego as developing through a succession of stages throughout the lifespan. Each stage imposes a new task, but the social importance of these tasks is such as to make them more in the nature of crises, which is the term Erikson uses. Passage through each stage is dependent on the successful resolution of previous crises, and in turn makes a new dimension of social interaction possible. An important aspect of the crises is that they represent a tension between opposite polarities which is not resolved by the complete conquest of the negative polarity. To the contrary, success is defined as the achievement of a balance that is slightly in favor of positive over negative, the implication being that both are necessary for healthy resolution of the crisis. Another feature of the stages is that the crisis is never completely resolved for all time. Though each stage has its characteristic problem which becomes the preoccupation of that age, traces of the problem may be discerned at both earlier and later stages. For example, the problem of establishing an identity is especially crucial at adolescence, but it may erupt again in the form of the mid-life crisis. Helen Lynd (1965) shows that an analogy with the individual life history may be drawn for the long historical view of the human species. People of any age have a kind of temporal centrism which may be as constraining to the outlook as ethnocentrism. In every age we find the recurring questions: Who am I? and Where do I belong? But it is manifest that the recurrent question of self identify is today in the forefront of awareness. In the last quarter of a century we have been forced as a people to assimilate the implications of an economy of potential abundance, the import of instant communication throughout the world, the fall of empires, and the emergence of nations, the horrors of concentration camps and atomic war, of pollution and carcinogens, and fundamental changes in the Puritan ethic on which our nation was founded. Each of these historial developments have given our search for identity special possibilities, special difficulties, and our own peculiar version of its importance. These facts are reflected and magnified in the adolescent's search for his own identity during this period of history.

When a question is of particular importance, as the question of identity is at present, it receives special attention from social scientists who label and codify its different aspects, thus raising public consciousness of the phenomenon. When the object of scrutiny is the self, ready access to terminology and analysis results in increased preoccupation with every aspect of subjective existence. The proliferation of popular terms and cliches, (anomie, escape from freedom, the age of conformity, and so on), may become a substitute for thought leading to a reliance on categories that may sometimes act as barriers instead of a means of access to understanding (pp 13-15).

In figure 1, the successive stages are placed on the diagonal in order to depict graphically the cyclical and recurring nature of these problems so crucial to healthy development. As might be expected from this allegiance to the psychoanalytic tradition, the early stages of Erikson's schema correspond closely to those of Freudian psychology, the difference being that whereas Freud, by concentrating on the location of the erogenous zones, rooted his theory in biology, Erikson emphasizes the psychosocial dimension as reflected in the events and climate of the immediate culture. The first stage bears some resemblance to Freud's oral stage where the task is to establish, in Erikson's own words, patterns of basic trust over mistrust. The degree to which these patterns are successfully established depends primarily on the quality of maternal care seen in attending to the infant's needs and providing him with love and stimulation. Where this is adequate, the infant will develop attitudes of trust and confidence in himself and other people. If caretaking is inadequate or irregular, an attitude of passivity and helplessness combined with suspicion and mistrust will become enduring personality traits. By way of illustration, Erikson cites the studies of Rene Spitz on institutionalized children, whose physical needs were adequately met, but who lacked the cuddling and playing that children in normal homes receive from their parents. As these children reached early childhood, they exhibited the typical characteristics of apathy and joylessness that have come to be associated with institutionalized children. Additionally, they seemed extremely vulnerable to recurring ailments and diseases, and several of them actually died. Children who survive such early treatment, Erikson hypothesizes, will succumb to a "mild but chronic state of mourning which may give a depressive undertone to the whole remainder of life" (1959, p.60).

During the second and third years of life, which correspond to Freud's anal stage, the crisis revolves around the infant's need to establish autonomy. The negative pole of this dimension is shame and doubt. While it is the maturation of his intellectual and motor abilities that propels the child into this crisis, it is the way these new powers are encouraged and channeled by adults that determines how the crisis will be resolved. If mobility and exploration are encouraged, if the child's budding powers are met by appropriate challenges, then autonomy will emerge in the ascendance over shame and doubt. On the other hand, if adults are impatient or mete out severe punishment for small misdemeanors, or when there is no perceived consistency between the child's behavior and adult reactions, then the sense of autonomy is blunted, and feelings of shame and doubt become pervasive. As previously noted, Erikson does not view complete absence of the negative pole as the ultimate desideratum. An individual who is incapable of shame or self-doubt is as ill-equipped to function in society as one who has a weak sense of autonomy.

The social dimension that appears at the third stage is that of initiative vs. guilt. In classical theory, this is the period of the Oedipal struggle followed by identification with the like-sexed parent. In Eriksonian terms, "being firmly convinced that he is a person, the child must now find out what kind of a person he is going to be" (p.74). He identifies with his parents and fantasizes what it would be like to be them. Here he is helped by his increased mobility, his rapidly developing facility with language, and his power to use symbols to replace objects. Now that he is fully at ease in the use of these combined powers and achievements, he can use his abundant energy to give free rein to his imagination, which now knows no bounds. He is able to move independently and vigorously, and can begin to conceive of himself as having the same powers and privileges as adults. The danger is that these wild speculations can be frightening, carrying as they do the potential for danger and parental retribution. There emerges in response to these threats what Erikson calls "the great governor of initiative," namely conscience. Again, the danger is that adults who inhibit their child's sense of initiative by proscribing or limiting activity or by turning aside his intellectual explorations, may promote the growth of conscience over the sense of initiative.

Freud's belief that the personality formation is accomplished through socialization of the sexual instincts led him to view the years of middle childhood as a period of latency in which little of interest to a psychologist is taking place. By contrast, Erikson sees the age of 6 to 11 years as extremely important, a period in which the child is exposed for the first time to social institutions other than the family. The developmental task of this period is to learn the tools of the culture. In western societies, schools are entrusted with the business of ensuring that all children are appropriately equipped to contribute to their society and to profit from the good life it provides in return. In turn, the child, if he has been successful at earlier stages, musters all his energies and enthusiasm to learn these basic skills and to meet the expectations of the society in so doing.

There is a preoccupation at his age with constructing things and doing things, often in cooperation with peers. Indeed, the peer culture assumes new importance as the significance of team work and rules becomes apparent to the child. The essence of this period is the industry, the drive with which projects are approached. If nurtured through constructive challenges, this sense of industry will form the basis for lifelong patterns of work. If, however, the elementary school is a joyless place where the work imposed seems irrelevant to the child's own purposes, where learning the tools becomes a drudgery instead of a pleasure, there is the chance that academic activities will come to have a negative connotation that will spill over into later attitudes to work in general. Although Erikson calls the converse of industry "inferiority," the ramifications of unsuccessful passage of this stage would seem to extend beyond the usual meanings of this word. True, the child who experiences repeated academic failure may come to have a deep and abiding sense of inferiority. But even the child who is capable of learning what he is supposed to learn during this period may, if the climate of the classroom promotes such feelings, leave the elementary school with a strong distaste for school work and negative attitudes toward persons in authority that will be counterproductive in the workplace.

The period of adolescence, extending from 12 to 18 years, is of especial interest in Erikson's schema. In Freudian theory, adolescence saw the reawakening of the sexual interest, this time in relation not to the opposite sex parent but to a partner of one's own age. For Erikson, this is only a part of the nexus of complex, interrelated problems that constitutes adolescence, and all these problems have to do with the young person's emerging sense of identity. However, the sense of identity is now multidimensional. It embraces physical identity, for with the rapid growth and maturation of his sexual prowess, the youth must wrestle with his concept of himself as a physical entity, tall or short, strong or weak, handsome or plain: in short, he must develop a realistic body image. He must also assess his self-worth and his capabilities with respect to the opposite sex. His newly found powers of deductive reasoning and his passage into the world of high school open up vast horizons of knowledge and a multitude of possible ways of thinking about and reacting to the world. His imagination is now limitless. He can conceive of families and societies vastly different from his own, and is often impatient with what he perceives as apathy and hostility in the face of monumental social problems. An important aspect of identity at this stage relates to the young person's idealism and sense of civic responsibility, and his decisions as to the ways in which he meets this responsbility in terms of his own career and life style.

He engages in endless discussion with his peers on some of the vital issues posed by his own internal struggles and the intransigeance of the people around him. How well these problems are resolved will depend not only on whether he has attained a strong sense of autonomy, initiative, and industry during the earlier stages, but on the nature of the social milieu in which these problems are being worked out. It is clear that, in some sense, a sheltered environment may lead to an apparently easy resolution of the identity crisis, but this may be deceptive. The problem may simply reappear with greater severity, and at a more inappropriate time in terms of the person's career. For example, a boy whose father evinces strong desire for his son to enter a specific occupation and to follow in his footsteps may find the boy compliant, and yet the son may later feel resentful that he was not given the opportunity to explore other alternatives, and may end up pursuing some completely different (and, in his father's view, inappropriate) line of work.

So many threads are brought together and intertwined to form the budding sense of identity, that it is hardly surprising that the adolescent finds difficulty in resolving each of these crises and of striking a balance among them. When societal roles are vague or poorly structured or are undergoing profound change, the problem is likely to be compounded. The result may be what Erikson calls role diffusion, that is to say, rather than becoming increasingly crystallized, the roles become more and more diffuse and ill-defined. The adolescent moves rapidly from one role to another, without fixating or finding pleasure in any single one. In the case study of Joseph Kidd, Robert White describes a "person without a personality" who, during his college career, tried out many different "masks," only to find himself increasingly frustrated when none of them worked. Only through intensive counseling and a complete change in career plans was he able to achieve a consistent personality that matched his capabilities and objectives. Erikson himself has documented a case of severe identity diffusion in the psychohistorical study of Martin Luther. The case study method used by Erikson and other authors seems particularly suitable for exploring the dimensions of both the crisis and its implications for later personality development and subsequent achievement, but there is not a wealth of such studies, presumably because, illuminating as they may be, they are time-consuming to conduct and incapable of generalization beyond the particular case.

The crisis of identity vs. identity diffusion is pervasive in American society. As Erikson notes, our insistence on self-made identities, the simultaneous presentation of ideals and traditions on the one hand and disillusionment and egocentrism on the other make it difficult for adolescents who are not yet sure of what they are or what they are going to be, and are trying to "get it all together " to make these important life decisions, or having made them, to stick with them. A danger is that they will be content to accept the shadow for the substance, to espouse as their ideal models those who are actually phony representatives of a system they have perverted to their own ends. To quote Erikson "In order not to become cynically or apathetically lost, young people in search of an identity must somewhere be able to convince themselves that those who succeed there by shoulder the obligations of being the best, that is, of personifying the nation's ideals. In this country, as in any other, we have those successful types who become the cynical representatives of the "inside track", the "bosses" of impersonal machinery. In a culture once pervaded with the ideal of the self-made man, a special danger ensues from the idea of a synthetic personality, as if you are what you can appear to be, or as if you are what you can buy. This can be counteracted only by a system of education that transmits values and goals which determinedly aspire beyond mere "functioning" and "making the grade" (p.94).

As with earlier stages, the crisis of establishing identity while retaining the flexibility to diffuse or switch roles (which is so necessary in a changing society) lays the foundation for the next stage, that of early adulthood. Only when a reasonable sense of identity has been established is real intimacy with the other sex, or with other persons, possible. The youth who is unsure of his identity shies away from interpersonal intimacy either by isolating himself or by seeking love and fellowship in repeated attempts and repeated failures. Unfortunately, many young people, feeling that the privileges of adulthood have been postponed long enough, become frustrated under these circumstances and embark on marriage or other forms of intimacy which, in effect, are only a semblance of the real thing. The premature obligation to act in a defined way as mates and parents adds a further strain to the unresolved task of establishing one's own identity.

These five stages covering the period from birth to young adulthood comprise that portion of Erikson's theory that has particular relevance for this discussion. The period of adolescence has direct application to the present purpose, but the epigenetic nature of the theory suggests that prior stages must also be considered in attempting to determine the problems encountered by an individual or special group such as deaf youth.

Havighurst's Developmental Task Theory

Havighurst's theory, like those of Erikson and Piaget, is built around the concept of stages of development and its corollary, the concept of developmental task. Havighurst divided the lifespan into six stages: (1) infancy and early childhood, (2) middle childhood, (3) adolescence, (4) early adulthood, (5) middle age, and (6) late maturity.

Developmental Tasks and Education

In the third edition of his book (1972) Havighurst described a series of 8 tasks peculiar to adolescence:

1. Forming new and more mature relations with agemates of both sexes
2. Achieving a masculine or feminine social role
3. Accepting one's physique and using the body effectively
4. Achieving emotional independence from parents and other adults
5. Preparing for marriage and family life
6. Selecting and preparing for an occupation
7. Acquiring a set of ethics as a guide to behavior
8. Developing a social intelligence necessary for civic competence

1. Forming new and more mature relations with agemates of both sexes - Preadolescence is marked by the self-imposed segregation of the sexes in most of their leisure-time activities. Close personal friendships with a member of the same sex are the rule, while the opposite sex is either ignored or treated with disdain. The accelerated physical development of girls at this stage aggravates this situation. The security of the group setting enables its members to enter gradually into limited heterosexual relationships, so that by high school almost all boys and girls are socializing with the opposite sex in couples or groups. These interactions provide the requisite experiences for learning the appropriate sexual role.

2. Achieving a masculine or feminine social role - Though the past decade has seen considerable changes in the definition of sex roles, achievement of such a role still represents an important item of learning for most adolescents.

3. Accepting one's physique and using the body effectively - This may be an especially troublesome task for the adolescent, whose preoccupation with real or fancied imperfections makes it difficult to "become proud, or at least tolerant, of one's body." The problems of adjusting to rapid growth spurts and increased sexual drive, and the need to impress one's peers with feats of bravado may make it equally impossible to "use and protect one's body effectively and with personal satisfaction. Many lifelong problems stem from the failure to achieve this developmental task.

4. Achieving emotional independence from parents and other adults - American society sets great store by independence, yet places many obstacles in the path to its achievement, among which prolonged adolescent is perhaps the most influential. Though physically mature, the adolescent must

rely on parents for food, shelter, and clothing, and for money to purchase goods and entertainment. Whether they wish to or not, adolescents must continue to attend school for many years. For some these restrictions are offset by finding a part-time job, but even where available, this is typically regarded as a temporary solution. For their part, the parents are often ambivalent about severing the childhood ties and dubious about the adolescent's ability to make mature decisions and to engage in responsible behavior.

5. Preparing for marriage and family life - As the adolescent becomes more active socially with members of the opposite sex, the need to conform to parental and societal expectations must be faced. Attitudes toward, and decisions about, marriage and parenthood are consolidated. The choice of a suitable marriage partner assumes major significance.

6. Selecting and preparing for an occupation - Modern society offers a broad choice of occupations, many of which require high levels of advanced training. The huge investments of time and money entailed in preparing to work in certain fields makes the initial selection a matter of no small consequence to the individual and the society that provides the training and financial support. Choice of an occupation involves matching personal aptitudes and preferences with the requirements of various jobs, many of which are poorly understood, even mysterious. It is not uncommon to find adolescents holding highly fantasized or distorted notions about the prestige or financial reward attached to a position or about the responsibilities that accompany it. As Super ( ) has pointed out, choice of occupation requires both realistic self-concept and the dimensions of the occupation under consideration.

7. Acquiring a set of ethics as a guide to behavior - Every society has prescribed codes that place legal and social restrictions on individual behavior. Beyond these, however, the cultural pluralism of American society allows for a broad range of values, attitudes, and life styles. Exposure to these diverse life styles through mass media and the frequent clash of value systems between generations or different segments of the population have heightened awareness among young people to the possibility of choice. Ethical behavior is also a function of the level of moral development attained (Kohlberg, 1969)

8. Developing a social intelligence - Many social concepts such as justice, freedom, and democracy, are highly abstract, and are not fully learned until adolescence. Even when a principle is clearly understood, it may conflict with another principle, and there is no simple resolution to many complex problems that stem from this conflict. Controversy abounds in a complex, pluralistic society, often reaching emotional levels, or even violence. The adolescent must chart a course through a sea of rhetoric, must learn to withstand arguments that appeal more to emotion than to logic, and to tolerate the ambiguity that accomanies problems that seem imponderable. Coping with dissension and turmoil, while remaining socially engaged in carrying one's civic responsibilities, is a major hurdle in the passage toward adulthood.

Kohlberg's Moral Development Theory

Piaget's theory of cognitive development is comprehensive in scope; it applies to intellectual growth across all disciplines and embraces concepts that are basic to all areas of inquiry, such as space and time, cause and effect, logical relationships, probability, number, etc., concepts which are as applicable to the social sciences and humanities as the physical sciences. One area that attracted Piaget's attention early in his career was that of moral development in children. As in his other naturalistic studies, he observed children of different ages at play, asking questions that would clarify their concepts of rules, justice, and fair play, and probing their responses for elaboration. The all-pervasive characteristics of egocentrism and absolutism seen in other spheres also pervade the moral realm. The attributes of children's moral development according to Piaget are these:

1. Younger children assess the severity of a transgression according to its consequences, whereas older children become more aware of intent also.

2. Punishment is viewed as inherent in the act itself --- justice is "immanent" -- according to young children. Older children come to the realization that punishment evolves from human principles that determine its appropriateness to the crime.

3. Distributive justice also appears in young children's thinking. External retribution follows inexorably in direct proportion to the enormity of the crime. Older children are more sensitive to mitigating circumstances or the possibility of restitution on the part of the transgressor.

4. Rules are absolute and inviolable in the mind of the young child, whereas older children perceive the relative nature of rules and the fact that they can be changed by mutual agreement.

Kohlberg (1971) has recast and extended Piaget's formulations into the following stages:

I. Preconventional Level

At this level the child is responsive to cultural rules and labels of good and bad, right or wrong, but interprets these labels in terms of either the physical or hedonistic consequences of action, (punishment, reward, exchange of favors) or in terms of the physical power of those who enunciate the rules and labels. The level is divided in the following two stages:

Stage 1 (7 - 9 years) - The Punishment and Obedience Orientation. The physical consequences of action determine its goodness or badness regardless of the human meaning or value of these consequences. Avoidance of punishment and unquestioning deference to power are valued in their own right, not in terms of respect for an underlying moral order supported by punishment and authority (the latter being stage 4).

Stage 2 (9 - 11 years) - The Instrumental Relativist Orientation. Right action consists of that which instrumentally satisfies one's own needs and occasionally the needs of others. Human relations are viewed in terms like those of the marketplace. Elements of fairness, of reciprocity, and equal sharing are present, but they are always interpreted in a physical, pragmatic way. Reciprocity is a matter of "you scratch my back and I'll scratch yours," not of loyalty, gratitude, or justice.

II. Conventional Level

At this level, maintaining the expectations of the individual's family, group, or nation is perceived as valuable in its own right, regardless of immediate and obvious consequences. The attitude is not only one of conformity to personal expectations and social order, but of loyalty to it, of actively maintaining, supporting, and justifying the order and of identifying with the persons or group involved in it. At this level, there are the following two stages:

Stage 3 - The Interpersonal Concordance or "Good Boy-Nice Girl" Orientation. Good behavior is that which pleases or helps others and is approved by them. There is much conformity to stereotypical images of what is majority or "natural" behavior. Behavior is frequently judged by intention - "he means well" becomes important for the first time. One earns approval by being "nice."

Stage 4 - The "Law-and-Order" Orientation. There is orientation toward authority, fixed rules, and the maintenance of the social order. Right behavior consists of doing one's duty, showing respect for authority, and maintaining the given social order for its own sake.

III. Postconventional, Autonomous, or Principled Level

At this level, there is a clear effort to define moral values and principles which have validity and application apart from the authority of the groups or persons holding these principles and apart from the individual's own identification with these groups. This level again has two stages:

Stage 5 - The Social-Contract Legalistic Orientation. This level generally has utilitarian overtones. Right action tends to be defined in terms of general individual rights and in terms of standards which have been critically examined and agreed upon by the whole society. There is a clear awareness of the relativism of personal values and opinions and a corresponding emphasis upon procedural rules for reaching consensus. Aside from what is constitutionally and democratically agreed upon, the right is a matter of personal "values" and "opinion." The result is an emphasis upon the "legal point of view," but with an emphasis upon the possibility of changing law in terms of rational considerations of social utility (rather than freezing it in terms of stage 4, "law and order"). Outside the legal realm, free agreement and contract is the binding element of obligation. This is the "official" morality of the American government and constitution.

> Stage 6 - The Universal Ethical Principle Orientation. Right is defined by the decision of conscience in accord with self-chosen ethical principles appealing to logical comprehensiveness, universality, and consistency. These principles are abstract and ethical (the Golden Rule, the categorical imperative); they are not concrete moral rules like the Ten Commandments. At heart, these are universal principles of justice, of the reciprocity and equality of human rights, and of respect for the dignity of human beings as individual persons.

Like Piaget, Kohlberg believes that each of his moral stages is prerequisite to all successive stages. Both parental guidance and the socializing influcence of peers are important factors in moral development.

Kohlberg's description of moral stages has stimulated a great deal of discussion and considerable research. Among the questions raised are (1) the relationship of moral judgment to actual behavior (Fodor, 1973; Saltzstein, Diamond and Belenky, 1971), and the educability of moral judgment (Turiel and Rothman, 1972).

In a discursive article on Kohlberg's stages of moral development, Gibbs (1978) has stated that the first four stages, which he calls "orientations," satisfy five criteria of developmental stage sequences in the Piagetian sense, viz.

> (1) Generality or consistency and a correspondence to analogous structural stages in other domains of development.
>
> (2) A natural upward tendency with resistance to extinction or regression.
>
> (3) Facilitated rates of stage development for subjects in an experientially enriched environment.
>
> (4) Gradual and consecutive upward movement through the stage sequence.
>
> (5) Commonly in evidence among members of the species from birth to maturity. (p.37)

The fifth and sixth stages, on the other hand, Gibbs argues, are not stages in the same sense, but "post-conventional," reflecting the emergence of ethical sentiments that may precipitate an "existential crisis" at any time during adolescence or adulthood. This highest level of morality "entails role-taking the claim of each actor (in a moral conflict) under the assumption that all other actors' claims are also governed by the Golden Rule and accommodated accordingly.....(Hence) valid ethical decisions require the perspective of an 'impartial spectator' or 'ideal observer'" (p.45). In fact, the "principled orientations" are formal ethical philosophies rather than natural stages of moral judgment.

Gilligan (1978) has identified another problem with Kohlberg's theory -- "the problem of women." The problem is that "the qualities deemed necessary for adulthood -- the capacity for autonomous thinking, clear decision making, and responsible action -- are those associated with masculinity but considered undesirable as attributes of the feminine self" (p.53). Gilligan concludes that developmental theories that find women's development aberrant or incomplete are one-sided, stressing autonomous judgment and action at the expense of the universal need for care and compassion. "The observation that for women, identity has as much to do with connection as with separation (also) led Erikson into trouble largely because of his failure to integrate this insight into the mainstream of his developmental theory" (p.80).

Chomsky's Theory of Transformational Grammar

Syntax is that part of grammar that has traditionally received most attention from grammarians. The beginning of the study of children's syntactic structures go back to Rousseau, and traces of modern theories of generative grammar may be found in the works of German writers such as Preyer and Stern in the nineteenth century.

Chomsky proposes a theory of syntax with far-reaching implications for the behavioral sciences. His transformational theory is built on a number of philosophical assumptions, most notably the notion of innate structures of the mind. (In this respect, Chomsky is in the direct tradition of rationalist philosophers going back to Plato.) In language these universals are manifested in the grammatical form of sentences. They reflect an underlying, biologically based structure which is shared by all members of the species. These structures predetermine the sequence and timing of linguistic development in the young child, which are the same, regardless of the language and culture to which the child is exposed.

Chomsky (1968) has described the process of language acquisition as a "kind of theory construction" in which "the child discovers the theory of his language with only small amounts of data from that language" (p. 284). This "theory of language" is predictive; that is, the child responds to the linguistic data that he receives so as to form generalizations about language which are reflected in his speech. Chomsky emphasizes that the process is much more than pure imitation, as may be seen from the child's production of novel sentences. The child's activity is dependent on innate restrictions on the form of grammar. Chomsky (1968) states that: "The restriction on the form of grammar is a precondition for linguistic experience, and it is surely the critical factor in determining the course and result of language learning" (p. 284). The fact that children can communicate meaning, the most abstract part of language, before they have acquired the grammar seems to call for some explanation. Chomsky introduces the concept of a Language Acquisition Device, or LAD, which takes the body of speech utterances to which the child is exposed and somehow constructs from it a grammatical theory.

Thus, the child uses the language universals which he possesses at birth to construct an internal picture of the syntactic structures of his language. He learns the ideal theory, that is to say, he approximates an ideal speaker-listener who has perfect knowledge of the language and who

BEST COPY AVAILABLE

carries around in his head a set of generative rules which constitute the transformational stage, the central factor in the tripartite structure of the grammar. The tripartite structure includes deep structure, transformational rules, and surface structure. The deep structure of a language defines, through transformational rules, the meaning and interpretation of a language. It is abstract, and is not represented in speech. Furthermore, as Chomsky (1968) writes:

> The rules that determine deep and surface structure and their interrelation in particular cases must themselves be highly abstract. They are surely remote from consciousness and cannot be brought to consciousness (p. 283).

The precise nature of the interaction with the linguistic environment that is necessary for the child to construct this ideal theory and learn the rewrite rules is unclear, as is the degree of "activity", mental or otherwise, that is called for.

> We must also bear in mind that the child constructs this ideal theory without specific instructions, that he acquires the knowledge at a time when he is not capable of complex intellectual achievements in many other domains, and that this achievement is relatively independent of intelligence or the particular course of experience (Chomsky, 1968, p. 284).

Perhaps Chomsky is a little clearer about what language acquisition is not. It is not a process of imitation, generalization, and reinforcement, key concepts of the behaviorist theory. There is ample empirical evidence to dismiss a probabilistic account of language. With respect to imitation it may be noted that: (a) children's ability to reproduce sentences they hear is limited to what they can produce in spontaneous speech (Ervin, 1964); (b) the order in which inflections appear in children's speech is weakly correlated with the frequency of these forms in the speech of the adults they hear (Bellugi, 1964); (c) when children fail to comprehend a sentence they are asked to imitate, the imitation either expresses a different meaning or no meaning at all (Slobin and Welch, 1967); (d) since children reconstruct adult models to make their own grammars, imitation plays no role in the acquisition of new transformations (McNeill, 1970); (e) children often produce regular forms of irregular verbs (e.g. digged) even though they have never heard these forms in adult

BEST COPY AVAILABLE

speech (Ervin, 1964); (f) children omit certain aspects of the model's utterance, e.g. his gruffness of voice; and (g) a child can pick up a second language from other children who are not precise or accurate in their speech (Chomsky, 1959). The concept of generalization has also been the object of some criticism. For example, the way very young children classify words into pivot or open class is more consistent with subtle differentiations they will make in the future than with generalizations from past experience. McNeill (1970), for example, cites the case of a child whose pivot class contained members of several adult grammatical classes (demonstratives, adjectives, possessives, etc.), although none of these classes were at that time a part of the child's grammar.

As for reinforcement, the concept plays no part in psycholinguistic models. External reinforcement is unnecessary to explain any part of language acquisition. The child is propelled into learning his native language by the inescapable fact of being human; his biological endowment of innate linguistic structures allows of no other outcome. In the context of his inexorable progress toward becoming the ideal user of his language, reinforcement seems a pale and insignificant factor.

These criticisms, while not all equally telling, in toto seem to present a compelling argument against Skinner's version of language learning. Automatic acceptance of the statement that the kind and amount of language exposure the young child enjoys is irrelevant does not necessarily follow, however. In fact, much heated discussion among Chomsky's followers has ensued around the topic of genetic determination. While agreeing that some significant innate component in language acquisition is necessary if we are to "build a viable developmental psycholinguistics," Slobin (1966) takes issue with McNeill on "how to determine just what sort of things should be considered "preprogrammed" and to what extent a human child is "wired up" with linguistic competence.

> It seems to me that the child is born not with a set of linguistic categories but with some sort of process mechanism--a set of procedures and inference rules, if you will--that he uses to process linguistic data. These mechanisms are such that, applying them to the input data, the child ends up with something which is a member of the class of human languages. The linguistic universals, then, are the result of an innate cognitive competence rather than the content of such a competence. The universals may thus be a derivative consequence of, say, the application of certain inference rules

BEST COPY AVAILABLE

> rather than constitute the actual initial information in terms of which the child processes linguistic input (Slobin, 1966, p. 87-88).

Such misgivings have led to substantial revisions of the original transformational theory, making way for a new direction, in which the preoccupation with syntax has given way to an enlarged interest in the semantic aspects of linguistic communication, and the cognitive basis of language learning has come under closer scrutiny (Macnamara, 1970). Some authors would go so far to say that "the Chomskyian revolution is over" (Wolfram, 1975).

Another argument that was seen as bolstering the need to postulate an innate mechanism was the rapidity with which children acquire language in the early years, a phenomenon which could not occur, it was maintained, if language followed the same course as other types of learning that depend primarily on experience. The fact that virtually all the syntactic constructions found in adult speech are found in the speech of a normal six-year-old was pivotal to the thesis. However, the past decade has seen the emergence of a number of articles and studies to suggest that the development of syntax is a much more protracted process than was assumed by the theory of transformational grammar, and that experience does play a role in its acquisition after all. In fact, there seems to be a hierarchy of difficulty for processing certain types of syntactic structure, which follows the kind of sequence we find in other types of learning, e.g. from the simple to the complex, from the familiar to the unfamiliar, from the concrete to the abstract, from the positive to the negative instance. All this we find in concept learning, problem solving, and other forms of higher mental activity. This evidence has been compiled elsewhere (Athey, 1977) and will only be summarized here. In brief, the studies cited may be said to demonstrate that:

1. Even the simplest constructions have many uses, and some of these are more difficult than others. The conjunction and, for example, may signify the joining of similar elements (e.g. bright and shiny), temporal sequence (e.g. he bathed and dressed), comparative degree (e.g. longer and longer), opposition (e.g. war and peace), social convention (e.g. he offered and I accepted) and causality (e.g. fight and die), among others. These uses are not explicitly taught, yet must be learned; such learning is still taking place in adolescence (Hatson and Shub, 1974).

BEST COPY AVAILABLE

2. Other conjunctions (when, so, but, or, where, while, that, and if) are very difficult, and intelligence is highly related to their comprehension (Stoodt, 1972).

3. Negatives introduce yet another dimension of difficulty (Neimark and Slotnick, 1970; Katz and Brent, 1968).

4. Syntactic errors arise where there is a suppressed noun phrase or verb phrase which the reader or listener must generate if he is to understand the meaning of the sentence, as in "The doll is easy to see" (C. Chomsky, 1972).

5. Children who understand separate words or symbols sometimes have difficulty integrating them into a meaningful message (Denner, 1970).

6. Many words in our lexicon, despite appearances to the contrary, are really relational, e.g. tall means relative to some standard (Donaldson and Wales, 1970), and relationships, comparisons, etc. imply additional difficulty.

7. The child's understanding of language is closely related to his understanding of events around him and of social conventions such as use of context, inflection, and concomitant action to infer meaning (Wolfram, 1975).

This research has led us to question the use of transformational grammar as a basis for a theory of developmental psycholinguistics. Pearson (1974-75) conducted a series of experiments to test counter hypotheses derived from the deep structure model and the chunking model, and found that the results systematically favored the latter. Basically, this means that the hypothetical memory storage units are large components such as complete sentences, rather than atomistic deep structure components such as "tall man" and "short girl" which must be synthesized if comprehension is to occur. Bransford and Franks (1971) demonstrated the superiority of the chunking explanation with adult subjects, thereby emphasizing the primacy of semantic over syntactic factors in fluent readers. On the other hand, the deep structure model may be more appropriate where the message to be understood is so difficult that it can only be understood in small segments.

Language acquisition in the deaf child

The hypothesis of linguistic universals implies that deaf children are born with the same innate structures and capabilities for language learning as other infants. Whatever form of

BEST COPY AVAILABLE

BEST COPY AVAILABLE

communication the child may be exposed to, the same deep structure will contain both the "kernel sentences" of discourse and the rewrite rules that permit translation from deep to surface structure, no matter what form that surface structure may take. Deaf children, on this hypothesis, are fully capable of learning a complete language with its own syntactic constructions. The fact that in Chomsky's theory, grammar is independent of meaning,* would be to the advantage of the deaf child, because he is equipped with the same innate structures for learning the grammar as other children. There is no theoretical reason, on this model, why he should not have the same full-blown language system by the age of six as his hearing counterparts, even though the syntax of sign language may be less well developed or differentiated than the syntax of English. Differences between deaf and hearing subjects would then be primarily a funciton of vocabulary.

Studies investigating deaf students' learning of syntax, such as those of Quigley (1977) and others, have concentrated on English syntax. In general, the finding is that deaf students follow the same order of acquisition of syntactic structures as hearing students, but that there is a time lag and, in many cases, a ceiling to their learning. Whether this is equally true of the syntax of sign language, however, has not been studied.

Linguists since Chomsky are less sure that meaning can be separated from grammar. Evidence is accumulating to suggest that considerable meaning is derived from syntax. Syntax helps the listener comprehend because his understanding of sentence structure helps him to narrow down the possibilities of what is to follow in subsequent parts of the discourse. Moreover, as Carol Chomsky has demonstrated, the meanings are not always overt; sentences with identical surface structures may have entirely different meanings because a different clause is suppressed in the two cases. Undoubtedly, cases like these, that are hard to explain except in technical jargon, and indeed rarely are explained to children, must be exceptionally difficult for the deaf child to grasp.

We have already noted that the process of learning English syntax is a much more protracted affair than was formerly supposed. Hutson, Bormuth, and others have shown that comprehension of some of these structures is still incomplete at adolescence. Since Quigley's studies have shown deaf children lagging behind their hearing counterparts we can only conclude that many deaf students are still struggling with them in adulthood, or alternatively, never learn them at all. At all events, it seems reasonable to conclude that instructors and counselors who deal with deaf adolescents, cannot assume the same mastery of language, or the same degree of comprehension of spoken and written material that they expect in hearing youth.

---

* (Hence we may have a perfectly grammatical sentence such as "Colorful green ideas sleep furiously" which is meaningless.")

As previously noted, when it comes to describing the precise nature of language learning, the theoretical formulations of the linguists are vague. McNeill, for example, felt a strong need to posit innate linguistic properties to account for the remarkable rapidity of language acquisition, but he seems to feel that this is all that needs to be posited. Fraser (1966) has retorted that the "astonishing speed" of language acquisition is less astonishing when we consider that the child is working constantly on acquiring language from the birth to the age of six or beyond. The "mere exposure" which McNeill discounts as the medium for learning actually brings the child into relational communication with adults and other children. Fraser also suggests that instead of arguing about the nature of innate capacities, we should get on with the job of discovering what precisely the language behavior is that the innate capacities and mechanisms are supposed to be explaining, and we might add, what are the effects of different kinds of exposure on different facets of language learning. In particular, we need to understand more about the correspondence between the syntactic structures of sign language and English, and to determine the degree of continuity or discontinuity between them.

Another limitation of Chomsky's theory, from the perspective of developmental psycholinguistics, is its complete neglect or lack of explanation as to how meanings are acquired. To be sure, Chomsky called his theory a "theory of syntax," implying that it did not extend beyond syntax. But we have become more aware in recent years of the interrelatedness of syntax and semantics, and any account of language development that failed to include words and sentences, even comprehension of the structure of paragraphs and stories, would today be considered incomplete. This is not the place to consider the implications of schema theory for language and reading in the deaf, but they must assuredly be profound.

BEST COPY AVAILABLE

Lenneberg's Biological Theory

Lenneberg (1967) presents a theory based on the premise that language has a biological basis and is the manifestation of species-specific cognitive propensities. "A biological predisposition for the development of language is anchored in the operative characteristics of the human brain." Thus, language is a peculiarly human function to which animal communication shows no evidence of approximation. Work by Thorpe (1967), Hockett and Altman, 1968), Gardner and Gardner (1969) and Premack (1971), which argues for a continuity hypothesis between animal and human language, might pose a challenge to Lenneberg's position, and the evidence at this point appears inconclusive.

The resemblance between Lenneberg's theory and that of Chomsky is obvious. However, Lenneberg, unlike Chomsky, presents a vast array of evidence from genetic, neurological, and psychological sources. First, language appears to be closely tied to general maturation. Important milestones in language acquisition are reached in a fixed sequence which cannot be accelerated by special training and are largely unaffected by such variables as intelligence, parental attitudes, or effectiveness in communication. Maturation of the latent language structures brings about a state of readiness, at which time adult speech elicits a "resonance" which releases the synthesizing process by which the child builds his own language structure. Hence, there is a critical period for language acquisition (2 to 4 years) corresponding to certain aspects of brain development. At adolescence, there occurs "the phenomenon of cerebral lateralization of function" at about the same time that the capacity for primary language acquisition declines. Cross-cultural research studies reveal the same sequence of linguistic events.

As further evidence of the innate biological basis of language, Lenneberg points to the universal properties of language: (a) all languages have a phonemic system; (b) all are concerned with the same aspects of the environment; (c) all languages can be judged as either grammatically acceptable or unacceptable; and (d) the syntax of languages is basically of the same type, consisting of words or morphemes that fit into functional categories. Language universals are determined by the limitations set by the cognitive functions characteristic of man. Concept formation is primary; applying linguistic terms to the categories is a secondary process. Maturation of cognitive processes comes about through progressive differentiation of experience, a traversing of highly unstable states whose disequilibrium leads to rearrangement of the elements of thought, adult thought being characterized by relatively stable arrangements. The period of disequilibrium of language is of limited duration, however; it begins around two years of age and declines with cerebral maturation in the early teens.

As previously noted, Lenneberg's theory is founded on a wealth of evidence from diverse sources, including observational studies of orphanage children, field research in central Brazil, New Guinea, and the American southwest, and a large number of clinical case studies of (a) aphasia due to brain trauma, and (b) deaf children.

It is also apparent that linguistic development follows the same sequence of stages regardless of the language to which the child is exposed. For example, McNeill (1966) found that both English and Japanese children master a generative transformational grammar according to certain universal principles. Ervin-Tripp and Slobin (1966) reported that the earliest grammar both in Russian and English appears before two years of age. In a further review, Slobin (1964) cited cross-cultural research on early stages of the acquisition of grammar as indicative of the universality of the stages and the process. Cazden (1969) has noted that studies of early language acquisitions do in fact show striking similarities in the stages of development across children, with equally striking deviations from adult grammar. Ervin and Miller (1963) observed that children acquire prelinguistic articulatory control by the age of 8-10 months, the onset of one- and two-word utterances between the ages of 1 to 2 years, and the use of plurals before age 3. Braine (1963) reported that 5 or 6 months after one-word utterances are established, children show an upsurge of different word combinations used in two-word utterances. (The number of different combinations recorded from one of Braine's children in successive months was: 14, 24, 54, 89, 350, 1400, 2500+ [McNeill, 1970].) Bellugi (1965) found a sequence of three stages between 18 and 36 months in the development of the interrogative. Ervin-Tripp (1970) also noted a fixed sequence in which responses to various types of questions were learned between the ages of 2.6 and 4.2 years. She further reports use of the past tense and the notion of intention as appearing between the ages of 3 and 4 years. McCarthy (1954, p. 526) observed the use of phrases and compound sentences after 2 years, and the use of clauses by 4½ years. Anderson and Beh (1968) concluded that lexical markers are learned hierarchically during the first and second grades of school. A study by Eimas, Siqueland, Jusczyk, and Vigorito (1971) showed that 1- and 4-month-old infants can discriminate consonant sounds in much the same way as adults. The peak of discriminability was found at the boundary between voiced and voiceless stops. Carlson and Anisfeld (1969) concluded from a longitudinal study of the development of a child's speech from the ages of 21 to 33 months that the child had an internal longuistic system and had acquired the patterns and sound relations inherent in English before he had mastered the specific sounds.

To show that language milestones are reached independent of environmental factors, Lenneberg (1967) points out that up to the age of 6 months, deaf babies and hearing babies born to deaf parents go through the same sequence of vocalizations as hearing children. Ervin and Miller (1963) also report that deaf children during the prelingual period (0-3 months) make the same sounds as hearing children. Lenneberg (1962) reported a case history of a child who was never able to speak, but who at age eight was capable of understanding complex syntactic structures.

Mothers' attitudes toward their children are not predictive, according to Lenneberg (1967), of the emergence of various stages in speech development. Children in orphanages are often below average in speech development at 3, but have caught up by the age of 6 or 7, when the environment is enriched, providing the resonance necessary to trigger the child's latent language structure is present. Brown, Cazden, and Bellugi (1968) in their observations of parental utterances, found no evidence of the effect of reinforcement or communication effectiveness of parents on the appearance of milestones in language development.

To show that language is also relatively independent of intelligence, Lenneberg (1964b) draws on his studies of retarded children. Children with IQ's ranging around 50 all possessed language, though articulation and grammar were poor, and continued to develop until the early teens, when language development "freezes." Lenneberg, Nichols, and Rosenberger (1964) studied 54 Mongoloids ranging in age from 6 months to 22 years over a 3-year period, and found that 75 percent reached at least the first stage of language development, although no subjects over 14 made any progress at all.

The evidence above may be summarized by the statement that language development is a function of the growth of the human brain. Hence, the maturation of language parallels the maturation of motor skills and cognitive processes in general. Other authors have described the acquisition of language structures in terms reminiscent of accounts of concept formation. Glanzer (1962), for example, describes the development of grammar as a tentative theory which the child must validate by testing. Brown and Fraser (1964) concluded that the child constructs his grammar by imitating adult speech in reduced form and inducing general rules, and they discuss the evidence of induced rules presented by the overgeneralizations children make which lead to errors (see also Cazden, 1968). Rearrangement of this stable generalization produces further differentiation.

The publication of Lenneberg's book Biological Foundations of Language has been hailed as "the event of recent years" in this area (Fillenbaum, 1971). Carroll (1968) evaluates it as "an extraordinarily careful review and interpretive discussion of what is known of the biological substrate of language" (p. 117). Bem and Bem (1968, p. 499) find that "in sum, Lenneberg's presentation is persuasive, and the weaker spots . . . do not impair the thrust of his major thesis."

Maturation. According to Carroll (1968), Lenneberg has added new evidence to that of Gesell, McCarthy, and others to show that language development is maturationally dependent. However, he questions the corollary of this position, that there is a critical period for language learning.

> The notion of a biologically determined lower age limit for first language acquisition would, I think, be accepted by all but the most extreme behaviorist. The evidence for a biologically determined upper age limit... is not so clear. It rests primarily on observations of the poor prognosis for language learning in the unharmed hemisphere in aphasics beyond puberty. A counter-theory would be that the apparent loss of cerebral flexibility is due solely to the accumulation of well-formed habits that interfere with efforts to establish new habits of foreign pronunciation...or to learn any new skill (p. 118).

Biological basis of language. The evidence for the existence of linguistic universals is overwhelming but, Carroll warns, we must exercise caution in inferring that these are biologically dependent. There are universal features of other human systems which may depend more on logic or on "the nature of things" than on biologically given capacities. As one universal feature, Lenneberg cites the fact that "all languages are concerned with essentially similar aspects of the environment," a tacit admission, in Carroll's view, that "some universal characteristics of language may arise from characteristics of the human environment rather than the human organism" (p. 116). Bem and Bem (1968) point out that

> it is not biological considerations which are prompting an increasing number of psychologists to accept some of the extraordinary conclusions about the innate character of linguistic competence, but the apparent failure of any current notions about learning to account for the new linguistic observations in even a remotely satisfying way (p. 498).

In other words, one may be persuaded of the innateness of certain linguistic competencies without necessarily being committed to the biological hypothesis.

Localization of speech functions. Whitaker (1969) is committed to the biological hypothesis. He praises Lenneberg for demonstrating the relevance of biology for the study of language. However, he is critical of his conclusions concerning the localization of brain function in language. Lenneberg maintains that clinical evidence based on studies of lesions of the brain is suspect because of the great variety of lesion types which are difficult to locate and isolate. Whitaker (1970) believes that his own summary of research on the correlation between functions and brain loci makes a "plausible case" in support of the localization position. For example, Lenneberg argues that it is not possible to assign a specific neuroanatomic structure to language capacity. Whitaker agrees, but points to certain histological differences in the cortex of the speech areas. The anterior border of Brodmann's area 44 in man is unlike that of any other primate. Penfield and Roberts' (1959) and von Bonin's (1949) work also support Whitaker's position.

Cognition and language. Lenneberg argues that linguistic competence is part of a more general cognitive competence, but the nature of this relationship is not made clear, nor is the supporting evidence entirely persuasive. However, a review of other models reveals that the linguists are in no better position in this regard.

Learning. While Lenneberg must be credited with assigning a role to learning in his account of language development (as opposed to McNeill, for example), again the nature of the learning is not made explicit. Granted that language emerges "by an interaction of maturation and self-programmed learning" (p. 158), it becomes necessary to specify the principles by which the learning and the interaction proceed.

Resonance. It must also be admitted that the concept of resonance does not receive a satisfactory explanation in the discussion of language acquisition, nor is there a readily discernible method for verifying such a concept.

In summary, we may say that nativistic models, especially Lenneberg's, have made a profound impact on the study of language. It is as yet too early to assess the validity of these models on the basis of research evidence. In addition, Lenneberg's theory has generated controversy concerning the nature of linguistic universals, the localization of brain function, and the continuity of human and animal speech. All these issues remain open, suggesting the need for further research before a valid assessment of his model can be achieved.

Maslow's Hierarchy of Needs

Many different concepts have been invoked to explain human behavior--instincts (McDougall), drives (Freud, Hull), valences (Lewin), among others. One of the most useful has been the concept of need as developed by Henry Murray, David McClelland, and Abraham Maslow. All these authors have made substantial contributions to our understanding of personality dynamics through their elaboration of this concept, but for purposes of this review, we will focus on the theory of Maslow, since it has been widely quoted and influential in the field.

Maslow (1954) proposes a list of eight basic needs arranged by hierarchy of prepotency. The prepotent needs are more urgent and insistent than the others under conditions of equal deprivation. Until the prepotent needs are reasonably satisfied, the others do not emerge or function as motivators of behavior. These basic needs in order of propotency are: (1) physiological, (2) safety, (3) belongingness and love, (4) importance, respect, self-esteem, independence, (5) information, (6) understanding, (7) beauty, and (8) self-actualization. A person whose physiological needs remain chronically unsatisfied will, in most instances, be totally unconcerned with anything beyond satisfying them. When these are satisfied, then he can turn his attention to needs at the next higher level. While it is true that a few exceptional individuals may reach a state of high altruism and self-fulfilment through self-denial, in general it is true that the most direct way to cultivate a life at the higher levels is to ensure that the lower needs receive adequate gratification.

Physiological needs. These needs form the starting point for many learning and personality theories. They are unlike other needs in that most of them can be readily identified, are insistent, can be easily satisfied by engaging in a certain form of behavior, and are cyclical in their appearance. Some are associated with specific parts of the body, while others are more diffuse. Moreover, their recurrent nature is attributable to depletion and regeneration of bodily tissues, or occurs as a function of the release of hormones, etc.

Safety needs. These needs are more often gratified than not in our society. However, their potency is readily apparent under conditions of physical threat or deprivation, during war or riots or terrorist attacks, in the reaction to unemployment or death of a family member, or during earthquakes or other calamities of nature. Children, who are more vulnerable in this respect, and less able to provide for their own safety needs, may fly into a panic or be inconsolable in the absence of parents. Even adults who lead a relatively sheltered and safe life seem to prefer stability and cling to the familiar in a way that guarantees safety from invasion by the unknown.

Belongingness and love. When food and shelter are provided, the needs for belongingness and love appear. These needs involve not only receiving but giving love. People seek close relationships with other individuals or groups of their own age and persuasion. Many societal ills have been attributed to the inability to form such relationships, leading to alienation and anomie.

Esteem. Everyone needs to have self-esteem, to believe in his own worth and integrity. As George Herbert Mead pointed out,"self-esteem comes about through the internalization of the attitudes and opinions of significant others" that demonstrate their esteem. It is not surprising, therefore, to find self-esteem is related to a person's respect and esteem for others, and that improvement in the first often leads to an increase in the second. Self-esteem also comes through a feeling of being able to cope with the environment, a feeling that may be engendered by learning new ways of coping, or by moving into or constructing a less threatening or less complex environment.

Information. The needs described from this point on are less clinically differentiable in terms of the pathology that follows their frustration. This does not mean that their frustration does not involve pathology; it may mean only that it has not been recognized as such. It would appear that some forms of psychopathology, particularly of the value system, can result from the ungratified needs for knowledge and for understanding. There is almost no research directed to this point. These needs, too, can apparently be lost. There are persons who avoid the possibility of acquiring specific information. This can develop as a result of frequent early punishment or derogation for inquisitiveness.

From another point of view, such needs as this and succeeding ones must be postulated as basic in man in order to understand his history. How else than by the presence of instinctual needs of these sorts can we possibly explain the enormous differences between man and other animals? It was pointed out that the need for understanding may have some relation to safety needs, but all animals have safety needs and none of the others have sought information consistently. It is possible that chimpanzees have a rudimentary form of this need or of the need for understanding, or both, and that this helps explain some aspects of their behavior. (See, for example, Harlow.) Furthermore, we see this need and the need for understanding reflected in the behavior of the most primitive men known to us. One of the earliest and commonest occupational differentiations is that of the medicine man or priest, who can "explain" particular aspects of the environment. (He may also attempt to control them, but this is secondary and the techniques are based upon the explanation.) In addition anyone who has watched children grow up knows how the normal child accumulates and treasures items of information and seeks for understanding. "Why?" is probably one of the most frequestly uttered words in the 4-year old's vocabulary. How many children are so thwarted then that this need disappears? A number of school problems are probably to be understood as the frustration of this and succeeding needs.

Understanding. We need to have some understanding of the world around us and of ourselves, and with some persons this is an intense craving. Because this and other higher needs have been generally overlooked as basic motivators, we have practically no studies of them. It is, however, clear that gratification of them is important. Interpretation of the world in terms of some religious or philosophical scheme is a part of every known culture. It is not of equal importance to every individual in the culture; variations in this and the subsequent needs may be very large. We have never evaluated the results for the individual who is forbidden areas of inquiry and understanding because of political or religious ideologies; hence, we do not know what kinds or degrees of pathology may result.

Beauty. Need for beauty is postulated on the basis of common experience rather than of clinical or laboratory research. As yet, it has not been demonstrated that its frustration can produce disease, pathology, or some other disturbance of the fullest possible development of the organism. Until that is done, it can only be included tentatively in a list of basic needs.

Self-actualization. There is sufficient clinical basis, not only in Maslow's own studies but also in many reports of therapy for assuming a need for self-actualization. All that a man can be he must be if he is to be happy. The more he is fitted to do, the more he must do. The specific form that this need will take must naturally vary with the capacities of the individual. It may or may not be expressed creatively, at least in terms of products which are detachable from the individual. It will probably always be expressed creatively in terms of life style. Effective self-actualization, however, can emerge freely only with prior satisfaction of the physiological, safety, love, and esteem needs, and some of the others. When it has emerged fully it seems to organize and to some extent to control these other needs.

Roe's Psychology of Occupations

What are the facts that determine occupational choice? Super's theory elaborates on the role of self-concept development and differentiation and the matching process that must take place between this development and the broadening of knowledge about various occupations that comes with adolescence. Anne Roe presents an alternative hypothesis that the individual's eventual choice is closely related to early experiences in the family setting that affect his attitudes, interests, and other personality factors.

By way of introduction to her theme, Roe discusses the nature of man as a social animal. Usually he lives as part of a family group that is loosely integrated into the larger society. While many forces are brought to bear in the formation of personality, it is in the critical early years, when the broad parameters of personality are being established, that the family is most influential.

There is no place on earth where life can be maintained without some work. In every society, even the most primitive, there is some division of labor. The primary division in most cases is along sex lines, and within this division of labor by sex, further differentiation is made on the basis of age. Secondary divisions, such as family membership, caste divisions, and minority status, also directly limit the number and kind of occupations open to a given individual. (Roe does not mention birth order and physical/mental ability among these secondary factors, but they would seem to be equally exclusive.) The rigidity with which these boundaries are perceived as constraining the individual will obviously be a powerful determinant of his eventual choice. These perceptions are acquired in the family setting and become an inherent part of the complex of attitudes and interests characterizing the individual.

But Roe's hypothesis is not confined to these determinants of vocational choice. In order to understand the role of the occupation in the life of the individual we must first have some understanding of his needs. Having dismissed the conept of economic man as inadequate, she searches for a theory of needs, and chooses Maslow's as the most relevant and adequate of the available theories.

> The application of this theory to occupational psychology is fairly obvious. In our society there is no single situation which is potentially so capable of giving some satisfaction at all levels (of Maslow's hierarchy) of basic needs as is the occupation . . . . the physiological needs . . . the safety needs . . . the need to be a member of a group and to give and receive love . . . . Perhaps satisfaction of the need for esteem from self and others is most easily seen as a big part of the occupation . . . We know too little about the remaining groups of needs to do much more than note their probable relation to occupations . . . (but) In almost any kind of work, it is more satisfying for the worker, and he will probably do a better job, if he knows what he is doing and why, and where his particular job fits into the

> total picture . . . . The need for beauty may be related to particular sensory or other capacities . . . and may also be reflected in many everyday activities of persons who are neither trained nor particularly interested in formal artistic activities . . . . (Finally) the need for self-actualization seems less likely to have specific concomitants in terms of particular occupations, but its strength may well be the key factor in differentiating those who put enormous yet easy and pleasant effort into their work from those who do not. This factor of happy effort and of the amount of personal involvement in the work is probably the most important single factor in success in the work. (Roe 1956, pp.31-34 italics added).

In relating vocational choice to early family experiences, Roe (1957) advances 8 hypotheses:

1. *The hereditary basis for intelligence, special abilities, interests, attitudes, and other personality variables seem usually to be nonspecific*. There may be a genetic basis for some "factors" of intelligence or aptitudes, but on this there is no clear evidence. Sex, as genetically determined, also involves some differentiation of abilities. It is, nevertheless, probable that in most instances genetic elements limit the degree of development rather than directly determine the type of expression.

2. *The pattern of development of special abilities is primarily determined by the directions in which psychic energy comes to be expended involuntarily*. The statement applies also to interests, attitudes, and other personality variables. Note the word *involuntarily*. It is intended to emphasize the fact that the things to which the individual gives automatic attention are keys to his total behavior. The point will not be expanded here, but the relevance of these hypotheses to the relations between personality and perception is clear.

3. *These directions are determined in the first place by the patterning of early satisfactions and frustrations*. This is the developing pattern of need primacies or relative strengths. In the earliest years these are essentially unconscious, and they probably always retain a large unconscious element. As noted before, we know nothing at all about genetic variability in basic needs, but it can be fairly assumed that it exists.

4. *The eventual pattern of psychic energies, in terms of attention directedness, is the major determinant of the field or fields* to which the person will apply himself. This is relevant not only to vocation, of course, but to the total life pattern of the individual. It determines what sort of special abilities and interests will be predominant.

> 5. The intensity of these (primarily) unconscious needs, as well as their organization, is the major determinant of the degree of motivation as expressed in accomplishment. This implies that all accomplishment is based on unconscious as well as on conscious needs, but it does not imply that these needs are necessarily neurotic. There is accomplishment which is a free expression of capacity, although this may be relatively rare. Accomplishment on this basis can generally be distinguished from accomplishment on other bases. The relevance of this hypothesis to eventual vocational performance is evident.
>
> It may not be so evident how the patterns and intensities of these basic needs are affected in the first place by the early experiences of the child. The following three hypotheses are are concerned with this problem.
>
> 6. Needs satisfied routinely as they appear do not develop into unconscious motivators. Intensity of the need is not a variable, since it is stated that the need is "satisfied." The fact that the satisfaction is gained routinely is important, and it implies the need to distinguish sharply between simple, direct, matter-of-fact need gratification and gratification with fuss and fanfare.
>
> 7. Needs for which even minimum satisfaction is rarely achieved will, if higher order, become in effect expunged, or will, if lower order, prevent the appearance of higher order needs, and will become dominant and restricting motivators. Lower order needs, of course, require some degree of satisfaction for the maintenance of life. The hypothesis would mean, e.g. that a child whose expressions of natural curiosity were thoroughly blocked, would cease to be curious. On the other hand, with less effective blocking, hypothesis 8 would apply.
>
> 8. Needs, the satisfaction of which is delayed but eventually accomplished, will become unconscious motivators, depending largely upon the degree of satisfaction felt. This will depend, among other things, upon the strength of the basic need in the given individual, the length of time elapsing between arousal and satisfaction, and the values ascribed to the satisfaction of this need in the immediate environment.
>
> The last hypothesis is the most significant for this review. It must be understood that the forms in which need satisfaction will be ultimately sought, in adult life, may not be obviously related to the basic needs referred to in the hypothesis. All of the well-known mechanisms of displacement, projection, etc. may function here. The problem of tolerance of deferred gratification is linked to such experiences as are implied in this hypothesis. (p.212-214)

Variations in the early experiences of children and, in particular, differences in parental handling of children are related to adult behavior patterns and, more specifically, to vocational choice. For purposes of discussion, Roe outlines three major categories of parental behavior, each having two subdivisions. It is important to note, however, that the specific behaviors of the parents are of less importance than their attitudes toward the child. It should also be noted that this classification refers to the dominant pattern in the home. The relative effects of maternal and paternal attitudes are not considered, though it would be reasonable to assume that the mother's would be more salient, given the proportionately greater amount of time she spends with the child in those critical early years.

The three categories and subdivisions are:

A. Emotional Concentration on the Child

This ranges between the extreme of overprotection to that of overdemandingness. Perhaps a sort of mean between these two is the quite typical anxiety of parents over a first child, anxiety which, in the same parents, may be much alleviated for the second child, with resulting considerable differences in the personality pictures of the two children.

1. Overprotection. The parent babies the child, encourages its dependence and restricts exploratory behavior. There is often concentration upon physical characteristics and real or fancied "talents" of the child. The parents maintain primary emotional ties with the child.

Homes in which children are the center of attention provide pretty full satisfaction of physiological and safety needs, and attention to needs for love and esteem, but gratification is usually not entirely routine. The overprotecting home places great emphasis upon gratification, and generally upon immediacy of gratification, which keeps lower level need satisfaction in the foreground. Belongingness, love, and esteem are often made conditional upon dependence and conformity and genuine self-actualization may be discouraged. There is likely to be encouragement of any special or supposedly special capacities, however. The overdemanding parent may make satisfaction of needs for love and esteem conditional upon conformity and achievement, which is frequently oriented to status. Needs for information and understanding may be encouraged, but within prescribed areas, and the same is true for self-actualization needs.

2. Overdemanding. The parents make heavy demands upon the child in terms of perfection of performance and usually institute quite severe training. In later years they may push the child to high achievement in school and work. In somewhat milder forms we may have the sort of family status "noblesse oblige" pattern, in which development of skills is encouraged but the pattern of skills is a prescribed one. This is very typical of upper class families, with emphasis upon development of conceptual as opposed to motor skills. Severer forms may blend into rejection or may be cover for this.

B. Avoidance of the Child

Here, too, two extremes are suggested -- rejection and neglect. Care below the minimum adequate amount has well-documented effects, as studies of orphans have shown. Most other studies have few, if any, children in this group. Parents providing this sort of home do not cooperate in psychological studies. (The author does not suggest that non-cooperation is evidence of this type of care!) Minimal need gratification is provided.

1. Emotional rejection of the child, not necessarily accompanied by overt physical neglect. Lack of gratifications is intentional.

2. Neglect of the child. This may, in fact, be less harmful psychologically than emotional rejection accompanied by physical care. It shades into the next classification. Gratification lacks are generally not intentional.

By definition, this group has major lacks in need gratification. Rejecting parents may provide adequate gratification of physiological and safety needs, but refrain from love and esteem gratification, and frequently seem deliberately to withhold the latter or even to denigrate the child. Neglect of physiological and safety needs, but not beyond necessary minimal gratification is much more tolerable than personal depreciation and deliberate withholding of love. If there is no contrast with attitudes towards others in the immediate group there will be stultification of the child's development in some respects but not distortion of it.

C. Acceptance of the Child

Children in this group are full-fledged members of the family circle, neither concentrated upon, nor overlooked. Parents are noncoercive, nonrestrictive, and actively or by default, encourage independence. The minimum amount of social interaction is supplied at one extreme (this may be very low) and at the other extreme the group approaches the overprotection one. The major breakdown in this group is on the basis of the warmth or coldness of the family climate.

1. Casual acceptance of the child. Non-interference here is largely by default.

2. Loving acceptance. Noninterference and encouragement of the child's own resources and his independence may be intentional, even planned, or a natural reflection of parental attitudes towards others generally.

Accepting parents offer reasonable gratification of all needs. This is unlikely to be emphasized in the way in which the first group do it, although the extremes of the loving subgroup may tend in this direction. Gratifications will not be deliberately delayed, but neither will delay be made disturbing. The major difference in the subgroups is probably in the way in which gratifications are supplied, and in the degree of deliberate encouragement and gratification of needs. (Roe, 1957, pp.214-215)

Hence, Roe is positing that the earliest subdivision of direction of attention, and one which has significance for the whole life pattern of the individual, is that referring to persons. The basic orientation learned through interaction with the parents is toward or not toward people. Depending upon which of the above situations is experienced, basic attitudes, interests, and capacities will be developed that will find expression in the general pattern of the adult's life, in his activities, in his personal relations, in his emotional reactions, and in his vocational choice.

Persons from child-centered families who do not develop primary self-concentration will still be quite constantly aware of the opinions and attitudes of other persons towards themselves and of the need to maintain self-position in relation to others.

Persons brought up in rejecting homes may develop intense defensive awareness of others; if so they will probably have aggressive tendencies which may most readily find socially acceptable expression in occupational terms. On the other hand, they may strongly reject persons and turn defensively to nonpersons, or they may be unaware of other persons as different from objects in the environment, so far as their own relation to them goes.

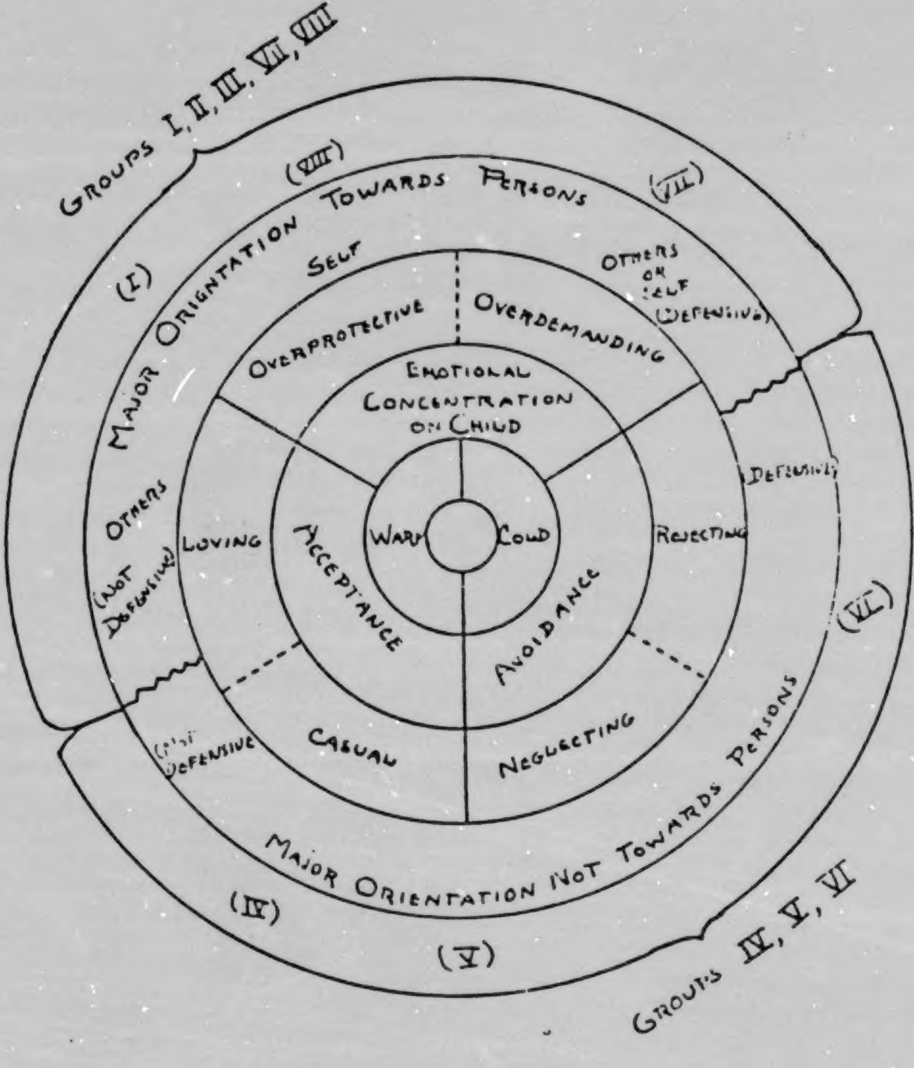
Persons from accepting homes may have primary interests in persons or in nonpersons; it will not be defensive in either case, and it will not carry the sort of uncertainty that many in the first group show.

It is thus possible to relate these attitudes directly to occupational choice. The major occupational groups in Roe's classification of occupations is based on two dimensions: focus of activity and level at which the activity is pursued, as may be seen in the following table. The relationship is also depicted figuratively as seen below:

Roe's Classification of Occupations

Groups	Levels
1. Service	1. Professional and managerial 1.
11. Business Contract	2. Professional and managerial 2.
111. Organizations	3. Semiprofessional, small business
IV. Technology	4. Skilled
V. Outdoor	5. Semiskilled
VI. Science	6. Unskilled
VII. General Cutlural	
VIII. Arts and Entertainment	

1. Relationship between Early Experiences and Vocational Choice


Groups I, II, III, VII, VIII
(VIII)
(VII)
Major Orientation Towards Persons
(I)
Self
Others or Self (Defensive)
Overprotective
Overdemanding
Emotional Concentration on Child
Others (Not Defensive)
Loving
Acceptance
Warm
Cold
Avoidance
Rejecting
Defensive
(VI)
(Not Defensive)
Casual
Neglecting
Major Orientation Not Towards Persons
(IV)
(V)
Groups IV, V, VI

BEST COPY AVAILABLE

Vocational choice in deaf adolescents.

What are the implications of Roe's hypothesis for the deaf? First, her observations about the restrictions placed on vocational choice by the cultural assumptions pervading the home are especially significant in the context of the family with a deaf child. Over and above the usual restrictions that are placed on a child by the accepted values and aspirations of his racial and social class affiliations, are the limitations on his vocational sights that are placed on him as a function of his handicap. These restraints may not be articulated, but be a part of the mutually accepted system of family beliefs. There is, of course, the alternative possibility that the primary reaction of the parents to their child's disability is one of denial, in which case they may overcompensate by ignoring the handicap or pretending that it presents no impediment to the pursuit of any occupation, however unrealistic this stance may appear to be an outside observer. Roe has done vocational psychology a service in pointing out that it is not at adolescence that parental attitudes or advice carry most weight in decision-making, but at the prelingual level of infancy and in the early years before cognition is fully developed where the critical variables of attitude to oneself and, more broadly, to people in general, exert a profound influence on the occupational choice and eventual life style of the adult.

Roe's hypothesis is of interest in that we may speculate that, while other categories may apply to the deaf in the same way that they do to the hearing, the basic attitudes of the parents may in each case be more exaggerated in intensity and outcome than would normally be true. For example, we may surmise that a mother whose basic tendency is to be overprotective to her child may find greater opportunity and social sanction for her behavior if her child is deaf. Similarly, a mother or father who rejects the child might tend to be even more rejecting of a child with whom they were unable to communicate. Presumably, if Roe's theory is correct, these attitudes will have implications not only for the child's interpersonal relationships in home and school, but also for the type of work he chooses and his success in that work. Counselors and advisers should also consider information about the dynamics of the home, as well as capactities and interests, in making vocational recommendations.

Super's Career Development Theory

When counseling first appeared in schools early in the twentieth century, it was almost exclusively vocational in nature. Later the emphasis shifted to the personal aspects of counseling and counselors found themselves spending most of their time dealing with behavior problems, disciplinary cases, and personal and family problems. Case conferences with parents consisted primarily in discussing graduation requirements and, as more and more students set their sights on college, the characteristics of various colleges and college admission policies. Vocational counseling became almost incidental in many high schools, especially those that concentrated on the college-bound population.

One reason for this change may have been the rise in interest during the 40s and 50s in the self-concept. Super (1963) places the beginning of this trend to coincide with the appearance of Lecky's (1945) treatise and Allport's (1943) rediscovery of the ego in psychology. (Throughout the 20s and 30s behaviorism predominated.) Following the publication of these two works, the self became a focal point of interest for personality theorists, social psychologists, and counseling psychologists. Instruments for measuring the self-concept began to appear,giving rise to a large number of studies. By 1961 the body of research literature on the subject was sufficiently voluminous for Wylie to publish a book critically reviewing the theory, concepts, and studies that had appeared to date.

Meanwhile, investigators interested in the study of vocational choice had been pursuing their own lines of research, much of it stemming from the availability of the Strong Vocational Interest Blank. Carter (1940) constructed a theory of the development of vocational attitudes as a result of his interest in adolescence and his work with the Strong, and Bordin (1943) introduced notion of vocational interests as reflections of the self-concept and of occupational stereotypes, also as a result of work with the Strong. In 1951 Leona Tyler published a paper on the relationship of aptitudes and interests in young children, using self-concept theory to explain her results. With the collection of more data on the same children, Tyler (1955) started to build a theory of vocational development around the concept of identity.* Tyler and Tiedeman, as a part of the Scientific Careers Project, developed several working papers summarizing their thinking on the relationship of self-concept and identity development as reflected in vocational choice. It remained for Super and his colleagues to bring together the two theoretical strands relating to the self and to vocational choice.

The elements of self-concept theory of vocational development are identified by Super as follows:

> Self-concept formation. In infancy the individual begins the process of forming a concept of himself, developing a sense of identity as a person distinct from, but at the same time resembling other persons. This is essentially an exploratory process which goes on throughout the entire course of life until selfhood ceases. How does this concept of self evolve?

---

* Erikson's theory of the adolescent identity crisis, which included a vocational component, appeared around this time.

-132

Exploration appears to be the first phase and a continuing process. . . . Just as the infant plays with his toes, or holds his hands in front of his face to observe the movement of his fingers, so the adolescent tries his hand at writing poetry, or admires the skill revealed by the masterpiece which he has produced in shop. Similarly, the older worker who can no longer maintain the pace which he had set as a younger man tries himself out at new methods of work to which he may be better adapted in view of the physical and psychological changes which he senses in himself. The self is an object of exploration as it develops and changes; so, too, is the environment.

Self-differentiation is a second phase in the development of the self-concept. Moving his hand in front of his face, noting that it moves as he wills it to, whereas his mother's hand appears to move independently, the baby notes "This is I, that is someone else." He goes on to ask, "What am I like?" and thus begins the search for identity. The small boy, son of his father, is aware of the fact that he is smaller, weaker, a milk drinker but not a coffee drinker, and so forth. The adolescent, member of a teenage group, may be aware of the fact that he does not dress as flashily or talk as much as most of his friends. Similarly, the recent graduate working at his first regular job notes differences in his approach to clients as contrasted with that which characterizes his fellow salesclerks, and is conscious of greater interest in the paper work associated with the job than they seem to manifest.

Identification is another process which goes on more or less simultaneously with differentiation. The man-child, aware of similarities between himself and his father and differences between himself and his mother, aware and also envious of his father's strength and power, identifies with his father and strives in various ways to be like him. As Tyler has pointed out, the variety of male roles in our society, associated with the variety and prominence of occupations in men's lives, channels the boy's identifications importantly although not solely, along occupational lines. . . . This is less true of the girl-child, whose adult counterparts more often work at home or, if they go to work, tend to talk about it less and seem less involved in their occupations.

Role playing is a type of behavior which accompanies or follows identification. The small boy who identifies with his father seeks to emulate him. . . . Whether the role playing is largely imaginative or overtly participatory, it gives some opportunity to try the role on for size, to see how valid the concept of oneself . . . actually is.

> *Reality testing* stems as readily from role playing as role playing does from identification. Life offers many opportunities for reality testing, in the form of children's play . . . in school courses. . . in extracurricular activities . . . and in part-time temporary employment. . . These reality-testing experiences strengthen or modify self-concepts and confirm or contradict the way in which they have been tentatively translated into an occupational role.
>
> *Translation of self-concepts into occupational terms*. The translation proceeds in several ways, although it should be noted that much of the theorizing on the subject is done by analogy from other aspects of developmental psychology and from everyday observation rather than inferentially from carefully collected and analyzed data. (1) Identification with an adult sometimes seems to lead to a desire to play his occupational role; this global vocational self-concept, assumed as a whole, may be just as totally discarded when subjected to reality testing. (2) Experience in a role in which one is cast, perhaps more or less through chance, may lead to the discovery of a vocational translation of one's self-concepts which is as congenial as it is unexpected. (3) Awareness of the fact that one has attributes which are said to be important in a certain field of work may lead one to look into that occupation; and the investigation may lead to confirmation of the idea that the role expectations of that occupation are such they one would do well in it and enjoy it. Here the translation may be made bit by bit . . . .
>
> *Implementation of the self-concepts*. The implementation or actualizing of self-concepts is the result of these processes as professional training is completed . . . . (or the youth), after a number of rejections, finds the occupational translation of his self-concept as ne'er-do-well confirmed and implemented. After a series of negative experiences, it takes a great deal of re-education to help him develop more positive self-concepts, to find a suitable occupational translation of his favorable picture of himself, and to turn it into a reality.

These appear to be the elements of a self-concept theory of vocational development. They are still not formulated as testable hypotheses, but judging by the research results so far, they do suggest and permit the formulation of hypotheses which tend to stand up when tested,and they can be helpful to counselors in dealing with the vocational decision-making of students (Super et al., 1963, pp.11-14).

Since these elements are sequential, it follows that whatever occurs in the earlier phases (elements) will have considerable effect on the outcome with respect to subsequent phases. Exploratory behavior would thus appear to be extremely important, and it is for this reason that it has been investigated rather thoroughly by Super and his colleagues. In particular, adolescence is seen as a period in which young people explore the world in which they live, the subculture of which they are about to become a part, the roles they may be expected to play, and the opportunities to play roles which suit their personalities, interests, and aptitudes. It is at the same time a period in which the adolescent, through experience and self-examination, clarifies his self-concept and begins to put it into words, finds out what outlets exist in society for one who seeks to play a given role, and modifies his self-concept to bring it into line with reality. Adolescent exploration is, in this view, a process of attempting to develop and implement a realistic self-concept (p.51).

However, several important questions arise:

(1) What distinction, if any, is there between vocational exploratory behavior and other kinds of exploratory behavior?

(2) Who decides whether an act or a behavior constitutes exploration--the individual who is engaging in it, or a sophisticated and impartial observer?

(3) Is is possible for the individual to engage in exploration without his being aware of the fact? In other words, can exploration be engaged in unconsciously?

(4) Must an intent to explore be present before an act can be considered exploratory?

(5) Is the process involved in self-oriented exploration the same as that involved in environment-oriented exploration?

(6) Does an act which can be shown to have affected a person's behavior, that is to say, to have had exploratory value, automatically qualify as exploration?

(7) Should the term exploratory behavior be reserved for self-initiated behavior, or can it be used in connection with other-initiated behavior as well?

(8) Can exploration be a purely mental activity?

(9) Does random trial-and-error qualify as exploration? (p.53)

As a result of raising these questions, and in an attempt to answer them, these researchers and model builders come to conceive of exploratory behavior as multidimensional in nature; a given behavior may be located on several continua:

1. Intended	Fortuitous
2. Systematic	Random
3. Recognized or described by the subject as exploration	Not so recognized or described
4. Self-oriented	Environment-oriented
5. Self-initiated	Other-initiated

6.	Contemporaneous	Retrospective
7.	Motor	Mental
8.	Intrinsic	Extrinsic
9.	Behavior-modifying	Fruitless
10.	Vocationally relevant	Vocationally irrelevant

It is readily apparent that where an adolescent's behavior stands on these dimensions will have a profound effect on the occupational outcome. Exploration which is goal-directed and planful probably accounts for only a small proportion of all exploratory behavior. In fact, there is a good deal of evidence to the effect that a considerable number of young people entering the labor market for the first time engage in haphazard and unsystematic exploration. Their efforts to make a place for themselves in the world of work are, for the most part, disorganized and diffuse. This exploratory behavior may also be a camouflage for ways of securing group approval or demonstrating masculinity, but the youth may be only dimly aware of these undercurrents. Moreover, self-exploration and scrutiny poses a threat to the individual's self-concept (cf. Lecky) and hence mobilizes his defenses. On the other hand, exploration of the environment may lead to genuine self-exploration. (The converse is also true.). Exploration initiated by other people, in many cases, is the critical factor that confirms or modifies a decision (e.g. the teacher or librarian who intercedes at just the right moment to change a career), but there is a strong element of chance involved, and self-initiated exploration is likely to be much more timely and productive. Not all exploratory behavior is acted on immediately. The experience may be stored and used in retrospective appraisals at some future time. The significance of an event is not always readily apparent at the time of occurence, since the individual may not have the requisite structures to assimilate it (Piaget) or it may be too threatening at the time to his value system (Lecky). People tend to repeat behavior which proves rewarding (rather than threatening), but the rewards may be internal, in which case the person does not need extrinsic reinforcements such as money or praise. He may even be capable of deferring such gratification in anticipation of greater rewards at a later date. All these dimensions contribute to the outcomes of the exploratory behavior, and the feelings the young person has about these outcomes. Ways in which behavior may be modified as a result of exploratory behavior include:

(1) Increased self-knowledge
    a. more realistic appraisal of one's interests, abilities, values, and personality traits
    b. more realistic appraisal of strengths and shortcomings
    c. increased understanding of reasons for behavior, feelings, and thoughts
    d. greater awareness of resemblances and differences from others.

(2) Increased ability to relate this new knowledge to future objectives

(3) Increased and more specific knowledge of

   a. occupational possibilities, their availability, character, requirements.

   b. expectations of persons who occupy a significant place in one's life; parents, friends, peer group, teachers, employer, etc.

(4) c. adult mores and expectations

   d. obstacles to be overcome to achieve one's objectives

   e. preferred occupation

(4) Changes in self-perception

   a. a more realistic self-concept

   b. a clearer and better differentiated self-concept

   c. a more integrated self-concept

   d. an expanded self-concept

   e. greater confidence in the self-concept

   f. a clearer sense of identity

(5) Changes in interests, values, goals, concept of success

(6) Decision to continue with or abandon a course of study, preference, occupation, or course of action

(7) Changes in the way problems are handled or relationships with people

(8) Greater awareness of the ways in which people or occupations resemble or differ from one another

(9) Greater differentiation of interests and abilities

(10) Seeing significance in something which previously had little, or a different, meaning

(11) Change to a vocational or educational objective which is more in line with one's interests, abilities, values, personality, self-concept, and financial means

(12) Clear understanding of the bases on which certain decisions which are confronting one should be made

(13) Confirmation or rejection of a previously held belief about self, others, or some aspect of the environment

(14) Increased awareness of the choices and decisions which are, or shortly will be confronting one

(15) Formulation, implementation, or both, of plans for attaining one's objectives, or for self-development

(16) Formulation and implementation of plans for further exploration

(17) Clearer formulation of objectives

(18) Increased confidence in, or commitment to, one's objectives

(19) More realistic plans for achieving the goals set for oneself

(20) More specific plans for achieving one's objectives (pp.59-60)

Factors which facilitate, impede, or inhibit exploration

There are a number of factors which determine the extent to which an adolescent will engage in exploratory behavior, some of them within the individual (1-10), others in the environment and more or less outside his control (11-16).

1. Ability to tolerate tension, uncertainty, and ambiguity. Systematic exploration can occur only when the individual is able to endure lack of closure and the feelings of uncertainty which accompany it. The person who lacks this ability is likely to strive for premature closure and to act implusively.

2. Ability to tolerate frustration. As the phrase trial-and-error indicates, trial involves the possibility of failure and hence frustration. The individual who cannot tolerate failure and frustration is likely to stop exploring after one or two failures and to make do with the information and responses that he has; or he may become disorganized and less flexible, and regress to random trial and error.

3. Objectivity. It has been shown in a number of studies that the individual's needs, biases, motives, and customary frames of reference influence his perception of a situation. The data on selective perception and perceptual distortion are sufficiently well-known not to require any further discussion here. These same factors and processes can be presumed to operate in, and influence, exploratory behavior. If the individual is to construct a complete and accurate map of some aspect of his external environment, his perception of it, as Baldwin (1955) has pointed out, must be determined by the properties of the situation and not by his own needs, fears, wishes, and so forth. Objectivity implies broad, unselective cognition, openness to experience.

4. Ability to make judgments or inferences. It is seldom possible for the individual to acquaint himself with every possible aspect of a situation. There are, for example, parts of his environment to which he is likely to be denied access (for example, the operating theatre of a hospital). In such situations the individual has to rely on what he has read, heard, or seen in the movies or on TV. His ability to evaluate these sources of information and to make justified inferences from them about the less familiar, remote, not directly accessible parts of a situation, is therefore a matter of considerable importance.

   The need for problem-solving ability is obviously not limited to the situation described above. It enters to a greater or lesser extent into, and influences the outcome of, all but the simplest kinds of exploratory behavior. It includes the ability to interpret information once it is obtained, and the ability to decide which items of information and which aspects of a situation are relevant for goal selection or for goal-directed behavior.

5. Confidence and feelings of adequacy. Persons who feel adequate to meet most situations, who anticipate success rather than failure but are not demoralized by failure when it comes, who are not unduly afraid of the unfamiliar or the unknown and and who are self-accepting,are more likely to explore than those who lack confidence and who feel themselves to be inadequate. The relationship between emotional adjustment and duration, quality, and amount of exploration would appear to be worth investigating.

6. Independence. Children who are not hedged in by restrictions, who are allowed considerable freedom of movement by their parents and who are not only allowed but actually encouraged to seek and engage in new experiences are, as the studies of Baldwin (1955) and Levy (1943) have shown, more likely to show curiosity and to explore than children of over-protective, possessive, and dominating parents.

   Whether and how much a person will explore is not merely a matter of how much independence he is allowed; it is also a matter of how independent he is. The person who is submissive and conforming and who habitually bows to authority will, as Schachtel (1959) says, tend to accept the evaluations of others instead of exploring for himself. Reliance on authority, whether it be that of the parents, or the peer group, or some other agency, tends to limit exploration or to confine it to certain channels. As Ausubel (1954: 200) has put it, "Unfortunately . . . the development of the exploratory orientation is severely curtailed in the course of age-mate socialization. The adolescent's marginal status and his dependence on the peer society for status permits very little deviation from group values, and hence little opportunity for independent exploration."

7. Knowing when exploration has served its purpose. There are certain situations in which continued exploration is not likely to yield any further significant information. Knowing when this point has been reached is not merely a matter of insight or judgment; it can also be a matter of adjustment. There are some individuals who find it difficult to achieve closure: there is always one further bit of information which has to be obtained before a decision can be made. The obsessive-compulsive is a case in point. Persons who wish to achieve absolute certainty before they act, who are not willing to accept the fact that any decision involves some element of risk, tend to continue to explore long after they have reached the point of diminishing returns.

8. Identification with the peer group. While too great reliance on the standards, values, and expectations of the peer group can limit or channel the adolescent's exploratory behavior, identification with the peer group can also have beneficial results. It furnishes him with the backing he needs when faced with conflicting demands of the kind described earlier. Given the support of the peer group and parents who are reasonably permissive and encouraging, vacillation, inaction, and half-hearted exploration can be replaced by more adequate efforts at exploration.

9. Defensiveness. Another factor which may curtail or affect the outcome of exploratory behavior is defensiveness. As Maslow has noted in an unpublished paper entitled The Need to Know and the Fear of Knowing, individuals employ a variety of stratagems to guard against finding out those things about themselves or their environment which they would rather not know.

   Selective perception and perceptual distortion can also be employed as defenses; along with such long-recognized defense mechanisms as repression, withdrawal, and rationalization, they enable the individual either to avoid exploration or to restrict and distort his findings. Self-concept theory suggests that individuals guard against discoveries which cast doubt upon the self-picture.

10. Self-concept. People tend to engage in those activities which enable them to maintain, and even enhance, the pictures which they have of themselves. If this is so, then it can be expected that the person's self-concept will facilitate some kinds of role-playing and exploration and impede others.

* * *

11. Outcome of previous exploration. The individual whose exploratory efforts in the past have met with success or resulted in some gratification is more likely to explore new situations and new solutions to problems than one whose previous efforts have met failure, derision, or punishment. The latter will tend to play it safe, to rely on the opinions of others, and to be content with the solution or job which is closest to hand or most strongly recommended.

12. Conflicting societal demands. While our society expects the adolescent to develop and give some evidence of independence, the manner in which independence is to be achieved and the forms it may legitimately take have not been formalized in America as they have in some modern, and certainly in primitive, societies. The result is that the adolescent has no clear set of expectations to guide him. As Mussen and Conger (1956:491) have put it: ". . . the adolescent who must face the problems of transition from childish dependence to adult independence is likely to be impressed, not with the solidarity of the expectations of the adults in this regard, but with their divisiveness. In one instance, or with one set of people, he is likely to find out independence responses are rewarded. In other instances, or with other people, he may just as easily find that they are punished. The church, the school, the members of the various social classes, even the adolescent's own parents may have different notions as to the time when adult protection and guidance should be relinquished in favor of greater individual responsibility."

    This inevitably leads to a great deal of conflict and ambivalence. When it is borne in mind that societal demands for independence compete with incompatible and well-established childhood dependence responses, it it not difficult to see why some adolescents are reluctant to explore. While uncertainty and conflict may, and often do, give rise to exploratory behavior (see our earlier discussion of Berlyne's theory)*, deeply rooted conflict and ambivalence of the type discussed above are likely to inhibit it

13. Psychological support and encouragement. When the parent or other adult whose approval and affection mean a great deal to him, encourage the individual in his efforts to play various roles or to extend his knowledge of the environment he is likely to be more venturesome than would be the case if this encouragement and support were lacking. Furthermore, certain

---

* Not included in this report

roles are difficult to sustain unless one has the encouragement and approval of one's parents or some valued adult. Such support and encouragement also help to moderate the conflict described in the preceding section.

14. Availability of roles and opportunities to explore. There are several factors that can limit the individuals's opportunities to play certain roles and to explore. One of these is socioeconomic status. As Hollingshead (1949) has shown, students from certain socioeconomic levels are not invited or do not feel free to participate in certain school and extracurricular activities. Socioeconomic status also influences the types of occupations the individual will become acquainted with through observation, heresay, and contact with other adults. They will tend to occupations located at the same level as the father's occupation.

Different social classes encourage different expectations, values, and aspirations. Thus the boy from a working class family may not only be disinclined to try out the role of scholar, but may find it difficult to sustain if he did. Working class families do not typically buy their children encyclopaedias and chemistry sets and send them to camp. The reason for this is not only financial, but also cultural; their values and expectations, and hence the interests and activities which they regard as appropriate for their children, are different.

Role-typing and child labor laws and trade union practices are two other factors which may limit opportunities for role-playing and exploration. The person who has been cast in a certain role, such as bookworm, clown, or rebel, may find it difficult to break out of the mold, and opportunities to try out other roles may be withheld from him. Child labor laws and trade union practices limit the kinds of work experience which it is possible for adolescents to get.

15. Maturity and the appearance of maturity. Adolescents who are perceived by adults as mature and responsible are likely to be given opportunities for role-playing and exploration which are denied their less mature peers. The maturity ascribed to them may be based on little more than size or the presence of certain secondary sex characteristics. Be that as it may, it has been shown that as adolescents grow older, job opportunities which were originally denied them because of their size and youthful-looking appearance now come their way more frequently.

16. Urgency. There are situations which, by their very nature, limit the amount of exploration that may be engaged in. Included in this category are situations in which there is an element of urgency, in which decisions must be made almost immediately, or within a specified interval of time.

The Deaf Adolescent: Putting It All Together

What do the models from the various categories, when considered as a group, tell us about the deaf adolescent? What information can be gleaned that might help us improve our understanding of his or her functioning?

At the outset a word of caution is appropriate. Deaf adolescents are individuals. At all costs we must avoid stereotyping these youth. It would be especially ironic at this time to develop a picture which came to be accepted as a delineation of "the" deaf person, just when the public at large is beginning to discard such stereotypes, and to show a greater sympathy and understanding toward deaf people.

However, psychology in general and developmental psychology in particular aim at achieving scientific status. This means that it deals in generalizations, in statements that can be made about groups, and the larger the group, i.e., the broader the generalization, the more satisfied the psychologist. Case studies of individual people or single units such as a family are of interest to the psychologist mainly to the extent that they confirm existing hypotheses or suggest new ones. Theories and models, by their very nature, are intended to refer to entire groups, or even to human nature in general. Therein lies their strength and their weakness. On the one hand, everyone, by virtue of being human, shares the same needs, drives, and characteristics to some extent; and by virtue of being a member of a given society, everyone shares to some extent the same socialization processes, or learning ways of satisfying those needs in a culturally acceptable manner. So we can hope to gain considerable insight from an examination of models of human development, because they are intended to apply to all human beings; there is, on the other hand, the consideration that variation among deaf individuals can be expected, just as it can in the population at large. At the same time, we might ask ourselves whether the range of variation on any given characteristic is as great among the deaf as it is among the hearing. This is an empirical question that must be determined separately for each variable.

To return, then, to the models, we might begin by considering some crucial questions, which may have implications for our entire discussion. These questions arise from the phenomenological models, of which, Lecky's was selected as the prototype. In essence, these models place the person, P, at the center of his psychological field. At birth the field is totally undifferentiated, because the infant is completely unaware of anything except his own sensations, which he does not separate into inside or outside his body. His first major task, which is both cognitive and affective, is to learn about the regularities in the environment, whether these be patterns of hunger followed by satiation, wetness followed by dryness, pain followed by relief, etc. Piaget maintains that these regularities are the basis for learning about object constancy, and hence the foundation for all later growth of concepts, principles, and higher thought processes. Erikson believes that these regularities provide the foundation for the establishment of patterns of basic trust, trust that one's needs will be taken care of, trust that one will survive in spite of one's vulnerability. Cognition and affect, at least at this stage, proceed hand in hand. These learnings represent, for the phenomenological psychologist, differentiation of the psychological field. Two questions immediately come to mind. Is the course of learning these fundamental patterns different or in some way deficient for the infant who is born deaf? Does learning follow the same course but proceed more slowly? To answer these questions, it would be necessary to examine the research that has been done on deaf babies, and to compare their course of development with what we know about those not so handicapped. Research with infants has many built-in problems, and hence there has not been as much as we would like. Only in recent years, for example, have we come to revise, as the result of research findings, certain former beliefs that were universally held (e.g., the new-born baby's world of "booming, buzzing confusion" as described by William James).

Cruickshank (19) sees the phenomenological model as a useful one for understanding the dynamics of all handicapped children. Because certain avenues of experience are cut off from them, and especially if they are overprotected by their parents, the pheonomenological field of these children tends at any age to be relatively undifferentiated. In infancy this is particularly critical. Growth (or differentiation) proceeds apace; learning is geometrical. Subsequent learning is built on the foundation of learning in infancy.

If Cruickshank is right about the relative lack of differentiation, what does this mean in terms of the adolescent? In many ways, it may mean that he does not have the background of information to fully understand events and their implications. He is not worldly wise (or even street wise) because, in Piagetian terms, he does not have the structures to which he can relate new experiences. If his reading is poor (as is very often the case), he does not compensate for the lack of information-gathering expertise at the spoken level by gaining his knowledge from print. We must assume, therefore, that this lack of differentiation not only persists into adolescence, but is compounded year after year to the point that the deaf adult is probably functioning in the society at a much lower level than his basic abilities would predict. Lack of differentiation, it should be pointed out, will extend across the cognitive, linguistic, personality, social, and vocational spheres.

A critical question related to the prelingually deaf infant has to do with the degree of trust that is possible for him to establish in relation to his surroundings. Does the deprivation of one source of information, namely hearing, seriously affect the infant's ability to discern those regularities on which trust is based? On the other hand, does the fact that he must rely more heavily on people than would be the case with a hearing infant to anticipate and meet his needs make him even more trusting (to the point of overdependency) than is necessary to establish that crucial balance Erikson speaks of? This question is significant not only on its own terms, but because the attainment of this first developmental task sets the stage for subsequent personality development and future behavior.

It will be remembered that Erikson postulated a recurrence of the developmental crises at various periods of the life cycle. Presumably this question of when to trust, whom to trust, and how much to trust is a recurrent theme, one that must be perpetually reassessed by all individuals at different ages and in different contexts. Too much trust can lead people into situations that are not only inimical to their interests, but may even be dangerous. By contrast, a person who cannot trust enough may become fearful, avoid situations that could be beneficial to him, or even become a recluse. This problem is becoming recognized as fairly widespread among the elderly, who become so traumatized by media reports of muggings and other forms of violence that they dare not venture out of doors and become prisoners in their own homes. While it is important that all people in a society learn to take reasonable precautions to avoid potentially violent situations and to care for their own safety, these precautions need to be made on the basis of statistical probabilities. It may be that many people who feel vulnerable overreact and hence deprive themselves of beneficial experiences. This may be especially true of handicapped persons who are afraid of many physical and social situations which they could handle quite well if they felt comfortable enough to take the risk. It is well to remember, however, that such attitudes and behavior patterns are the outcome of the treatment the person received in infancy, and may not be amenable to easy or rapid change.

Trust is the basis of autonomy. If the person cannot trust others, he cannot learn to trust himself, to have confidence in his personhood, to feel that he is important in his own right. A sense of autonomy is probably the single most important component of a fully developed, mentally healthy personality, and certainly the basis for later achievement, even for motivation to achieve. It is the foundation for a sense of initiative, for the work ethic, for a sense of identity, all of which undergird the eventual life style.

The critical task of the adolescent period is to establish a viable identity, one that is possible in terms of the individual's capabilities and limitations, and one that can bring continued, long-term satisfaction. Adolescents, under the best of circumstances, have problems with this task partly because, as we have seen, it is an enormously complex undertaking in this society. If deaf adolescents are experiencing severe problems in coming to grips with the tasks of this period, we must seek the roots of the problem at previous levels of the life cycle. What is the precise nature of the difficulties they are experiencing? Are their problems substantially related to their interactions and communications with other people? If so, can the reason be found in attitudes of too much trust or overdependency, or is the converse true, that they are unwilling to expose themselves to rejection or ridicule, and in effect, lack even the minimal level of basic trust? What is the effect of these attitudes on their sense of self-worth and autonomy? Do they lack the initiative to make and implement plans on their own behalf? Does their vision of the future include taking care of and providing for themselves, perhaps even for others, and if so, how realistic is this vision?

It is becoming increasingly apparent, however, that the most critical period of all, in terms of its effects on future behavior, is the period encompassing the years of middle childhood, that stage that Erikson calls "industry vs. inferiority." This is the time in which the child learns not only the "tools" of the society, but more importantly, the work ethic, that pride and joy in work which can sustain him through periods of drudgery and tedium in pursuit of a long-range goal. If these attitudes are not established at this time, the child may well become a shirker, an "artful dodger," possibly even a permanent liability to the group or society at large. This may be the time when the welfare syndrome is born. What happens in school is, therefore, extremely influential in determining the child's attitude not only to subsequent schooling but to work and life in general. This places a special responsibility on the shoulders of elementary school teachers. Teachers of deaf children of this age should be particularly alert to signs of such attitudes among their charges, since passivity is often cited as prevalent among deaf persons, even those who have the capability to attend college. Real or fancied defects or weaknesses are likely to be cited as a rationale for such attitudes.

What of the cognitive and linguistic accomplishment and potential of the deaf adolescent? Academically we know that he lags behind his hearing counterpart. His reading level is likely to be fourth grade, or lower. Reading is such a highly complex skill that there are many possible reasons for this lag, and the problem must be sought in a constellation of factors rather than in a single cause. Each problem compounds the others. Furth maintains that deaf youngsters are fully capable of developing concepts to the same extent as hearing students, though they may take longer to accomplish the same level of mastery. This may be true if a narrow definition of mastery is used. Experience suggests, however, that deaf students, even those who understand the denotative aspects of particular concepts are likely, through deprivation of experience, to lack the enriching connotations of words, aspects that permit more esoteric skills of detecting nuances, reading between the lines, and other higher level cognitive skills that make up reading comprehension.

Concepts are important not only to reading but to all subject matter areas. The lack of differentiation or connotative aspects of concepts affects the student's understanding of science and mathematics, social studies and literature. The comprehension problem pervades every aspect of school life. A person who cannot read is not a fully functioning member of this society, and even fairly young children are quick to discern this fact. Almost invariably, among hearing as well as deaf children, a reading problem eventually becomes a social problem. The child's burgeoning self-concept and feelings of self worth suffer a severe setback. Depending on other factors in the home or school environment, the child may become withdrawn or timid, may even be emotionally disturbed, or may turn to antisocial forms of acting out or delinquency. Deaf students may be spared invidious comparisons by being kept in a group where all the members are at the same level of achievement, but this is only postponing the inevitable shock and self-revelation which must come when they are exposed to the world of the hearing and enter into competition for jobs and other benefits of society.

Linguistically we have seen that a deaf child may learn a language that has its own fully developed syntactic system, which he may learn just as completely as a hearing child learns the syntax of English. However, it is likely to be a different syntax, and this may pose problems of transition at a later date. On the other hand, it seems important that the deaf preschooler should learn to communicate as fully as possible in a language that is not only easier for him to master but which teaches him the concept of syntactic structure (inductively and nonexplicitly, in the same way that all children learn syntax). This accomplishment would seem to be preferrable to imperfect and partial learning of a more complex and difficult syntactic system that permits only vague and imprecise understanding of communicated information. In either case, unfortunately, it appears from the experimental evidence that deaf students do not have a very good understanding of English syntax, and that this does affect their reading ability adversely. As we have seen, even hearing children do not always have the degree of syntactic understanding we attribute to them, but the problem is even more severe in deaf children.

When syntactic understanding is imperfect, then understanding is imperfect. The words that carry the burden of meaning in a sentence are the nouns and verbs (concepts) and the syntactic structures embodied in conjunctions, adverbial phrases, etc. One has only to look at the difference in meaning between two sentences that are identical except for these structural items to realize their import:

I will not go unless he comes.
I will not go until he comes.

We have no measures of how much comprehension is being lost both in listening and reading as a result of deficiences in these understandings.

As noted in our discussion of Chomsky's theory, even if knowledge of syntax were perfect, a significant proportion of the meaning of a message is carried by semantics and pragmatics, which are inextricably linked to syntax in any case. Imperfect as a deaf child's knowledge of syntax may be, it is probably in the semantic aspects of language that he is most severely disadvantaged. His concepts are improverished, or so it appears. But meanings are also conveyed in the relationships of words, in their positioning, in the choice of a particular word in preference to a close synonym, in the degree of emphasis conveyed by particular modes of expression, distinctions which may be particularly difficult for the deaf child to understand.

In the pragmatics of language, the deaf person may have the advantage. Research in recent years has drawn attention to the proportion of information in a message that is conveyed through nonverbal means such as bodily posture and movement, facial gesture, and proxemic variables, e.g., distance maintained during interpersonal transactions. Being deprived of the aural aspects of communication, the deaf person may rely more heavily on these nonverbal concomitants. However, these aspects may convey a distorted message, even the opposite message to what is being stated; and in reading, they are totally absent, and hence cannot be used as an alternative source of meaning.

Lenneberg's theory must be considered at this point, because its ramifications for the deaf are quite clear (if somewhat depressing). If there is indeed a critical period for language learning, and that period comes to an end with early adolescence, that would suggest that there is little hope that the deaf child who has not acquired the primary language by then is capable of ever becoming a fluent user of the language. Of course, the primary language may be sign language, and the child may be fully conversant with this language, and that is a most desirable outcome. On the other hand, sign language, though picturesque and colorful in its terminology and expressions, does not contain the elaborate differentiations and richness of the English language. A person living in a culture where the primary language is English who is in possession of a sparser language must inevitably be at a disadvantage. The fact that he does not know or may not even care about what he is missing does not change the stark fact that he is missing a great deal.

On a more cheerful note, however, there is some recent evidence to suggest that Lenneberg may have been mistaken in his assumption of an upper age limit for learning a first language. A critical test case was "the girl in the attic" reported by Victoria Fromkin. At last report, the girl, who had been isolated from all human contact from a very early age, was making progress during her adolescent years in mastering the basics of English and was communicating effectively with her peers in high school. We should probably adopt a compromise position, neither accepting Lenneberg's hypothesis uncritically nor rejecting it out of hand. The truth may be that, while it is not impossible to learn a first language at the age of puberty, it is extraordinarily difficult, and the learner can never hope to achieve the same level as someone who learns the language in the normal way. Maturational hypotheses notwithstanding there is much to be said for early learning, provided it is not coerced or made into a traumatic experience for the child.

What is the emotional and social status of the deaf adolescent, according to the models we have examined? Much depends, of course, on the kind of childhood he has experienced, and the demands that are being made on him as a person moving toward the responsibilities of adulthood in our society. As Mead pointed out, much of the "sturm und drang" of adolescence is culturally imposed. We send mixed messages to our youth to the effect that they are neither children nor adults, too big to be treated as children even while they are engaging in childish behavior, and yet too young to be given the responsibilities and privileges of adults. For the deaf person, adolescence may be a smooth and uneventful transition from the dependency state of childhood to the continued dependency of adulthood. Or it may be particularly stormy for a number of reasons, such as severe discontinuity between the demands of childhood and adolescence, belated realization of the need for autonomy and self-determination, accumulated frustration with attempts to communicate his needs to people who have the power and means to affect his life, and a variety of other factors. A third possibility is that the student takes the transition period in stride, and is able to cope with the tasks and problems with as little trauma as many hearing adolescents. Research is needed to determine whether a significantly greater proportion of deaf youth experience adolescent problems than hearing youth.

Developmental theory has provided us with one model of growth in the moral sphere, namely that of Kohlberg. His theory is closely tied to a Piagetian conception of cognitive development, and is therefore a stage theory. According o Kohlberg, most adolescents are at Stage 3 or 4, both of which fall in Level II--Conventional Role Conformity. The orientation is either "Good Boy" or "Authority and Social-Order Maintaining." The question now arises; if moral development is closely tied to cognitive development and dependent on it, does the well-recognized cognitive lag in deaf children entail a corollary delay in their moral growth? If so, we would expect to find many deaf adolescents at the Level I--Premoral level. This level incorporates Stages 1 and 2, the obedience and punishment orientation (egocentric deference to superior power or prestige) or the naively egocentric orientation, in which right action is that which satisfies the self's and others' occasional needs. Few or no studies have been conducted to test this hypothesis, so its validity currently rests on observation and other fragmentary evidence. Erikson has also remarked on the idealistic yearnings of adolescents. Because they have reached the period of formal operations and are now able to conceive of better worlds, they become impatient with the imperfect world of their immediate experience and scornful of adults who do not have the wit or will to change it. This frustration frequently leads to acts of rebellion, or even violence. Whether such a phenomenon is found equally among deaf adolescents is uncertain. There is some evidence that deaf adults are becoming more aware of and more assertive about their rights, but again, not much evidence as to whether this new awareness is shared by deaf youth.

Finally, on the occupational front, we know that adolescence is a period of searching for roles, examining one's self concept, and determining the values and interests that can best be satisfied in one or more types of career. This is part of Erikson's Search for Identity, and it implies a certain degree of self differentation, as well as the motivation to seek out information pertaining to specific vocations. Again, the deaf student may not have reached this stage by the time he is adolescent, a fact that could pose problems for those concerned with helping him define and implement a vocational choice. It should be noted that Erikson has remarked on the length of time it often takes an individual to settle on an occupational choice. He has called this period a "moratorium," because it seems as though the adolescent has entered a period of inability to make a decision, a period of relative inactivity, as far as progress toward a career and life style is concerned.

When an individual has experienced difficulty in negotiating earlier stages, it sometimes happens that this moratorium extends into the twenties or even thirties. Does this phenomenon occur more frequently among deaf persons? How many of them go from one job to another, without ever settling on a particular line of work, and to what extent is this due to external factors (unwillingness of employers to hire, lack of opportunities to develop skills, etc.) and to what extent a function of developmental lag, i.e., a late or extended moratorium?

We seem to have painted a very gloomy picture of the deaf adolescent, and we should hasten to add that it does not apply to all of them. It is possible to meet young deaf people who are alert, knowledgable, socially adept, and oriented toward a realistic vocation, and they provide us with an interesting test of the theories and hypotheses delineated here. We can only try to interpret the theories and to infer what they mean for the atypical adolescent. The picture is very complex. Where there is one kind of deficiency, this is likely to have implications for other types of deficiency. This is why we end up with such a negative picture. On the other hand, a study of those deaf students who seem to be adjusting to their handicap and coping with the demands and expectations of a frequently unsympathetic world present a challenge to these theories, as well as a potentially rewarding source of study.

Bibliography

Adler, E. P. (Ed.), *Research Trends in Deafness - State of the Art*. Department of Health, Ed. and Welfare, Washington, D.C., 1970.

Adorno, T. W., Frenkel-Brunswik, E., Levinson, D. J., and Sanford, R. N., *The Authoritarian Personality*, New York: Harper and Row, 1950.

Allport, G. W., *Personality*. New York: Holt, Rinehart, and Winston, 1937.

Allport, G. W., The ego in contemporary psychology. *Psychological Review*, 1943, 50, 451-478.

Anderson, S. A., and Beh, W. The reorganization of verbal memory in childhood. *Journal of Verbal Learning and Verbal Behavior*, 1968, 7, 1049-1053.

Athey, I. Language, reading, and the deaf. In Reynolds, H. N. and Williams, C. W. (Eds.), *Proceedings of the Gallaudet Conference on Reading in Relation to Deafness*. Washington, D.C.: Gallaudet College, 1978, 260-297.

Ausubel, D. *Theory and Problems of Adolescent Development*. New York: Grune and Stratton, 1954.

Baldwin, A. L. *Behavior and Development in Childhood*. New York: Holt, Rinehart, and Winston, 1955.

Bellugi, U. The emergence of inflections and negation systems in the speech of two children. Paper presented at the meeting of the New England Psychological Association, Boston, 1964.

Bellugi, U. The development of interrogative structure in children's speech functions. In K. Riegel (Ed.), *The Development of Language Functions*. Ann Arbor: University of Michigan Press, 1965.

Benedict, R. *Patterns of Culture*. New York: New American Library, 1950.

Benedict, R.

Bem, D. J., and Bem, S. L. Nativism revisited: A review of E. H. Lenneberg, Biological Foundations of Behavior. Journal of the Experimental Analysis of Behavior, 1968, 11, 497-501.

Bordin, E. S. A theory of interests as dynamic phenomena. Educational and Psychological Measurement, 1943, 3, 49-66.

Braine, M. D. S. The ontogeny of English phrase structure: The first phase: Language, 1963, 39, 1-13.

Bransford, J., and Franks, J. The abstraction of linguistic ideas. Cognitive Psychology, 1971, 2, (10), 331-350.

Brown, R. W., and Fraser, C. C. The acquisition of syntax: In U. Bellugi and R. W. Brown (Eds.), The Acquisition of Language. Monographs of the Society for Research in Child Development, 1964, 29.

Brown, R. W., Cazden, C. B., and Bellugi, U. The child's grammar from I to III. In J. B. Hill (Ed.), Minnesota Symposium on Child Psychology. Minneapolis: University of Minnesota Press, 1968.

Bruner, J.

Burke, D., Vocational rehabilitation and emerging mental health needs of the deaf. In Altshuler, K. Z. and Rainer, J. D. (Eds.), Mental Health and the Deaf. Department of Health, Education, and Welfare, Washington D.C., 1969.

Carlson, P., and Anisfeld, M. Some observations on the linguistic competence of a two-year-old. Child Development, 1969, 40, 569-575.

Carroll, J. B. Man is born to speak. Contemporary Psychology, 1968, 13, 117-119.

Carter, H. D. The development of vocational attitudes. Journal of Counseling Psychology, 1940, 4, 185-191.

Cazden, C. B. The acquisition of noun and verb inflections. Child Development, 1968, 39, 433-448.

Cazden, C. B. Suggestions from studies of early language acquisition. Childhood Education, 1969, 46, 127-131.

Chomsky, C. Stages in language development and reading exposure Harvard Educational Review, 1972, 42, (1), 1-33.

Chomsky, N. A. Review of B. F. Skinner, Verbal Behavior. Language, 1959, 35, 26-58.

Chomsky, N. A. Language and mind. Psychology Today, 1968, 2, 280-286.

Denner, B. Representational and syntactic competence of problem readers. Child Development, 1970, 41, 881-887.

Donaldson, M. Children's Minds. Glasgow: Fontana, 1978.

Donaldson, M., and Wales, R. J. On the acquisition of some relational terms. In J. R. Hayes (Ed.), Cognition and the Development of Language. New York: Wiley, 1970, 235-268.

Douvan, E., and Adelson, J. The Adolescent Experience. New York: Wiley, 1966.

Eimas, P. D., Siqueland, E. R., Jusczyk, P., and Vigorito, J. Speech perception in infants. Science, 1971, 171, 303-306.

Eisenberg,

Elkind, D. Egocentrism in adolescence. Child Development, 1967, 38, 1025-1034.

Erikson, E. H. Identity and the life cycle. In Klein, G. S. (Ed.), Psychological Issues. New York: International Universities Press, 1959, 18-171.

Erikson, E. H. Young Man Luther. New York: Norton, 1962.

Erikson, E. H. Gandhi's Truth: On the Origins of Militant Nonviolence. New York: Norton, 1969.

Ervin, S. M. Imitation and structural change in children's language. In E. H. Lenneberg (Ed.), New Directions in the Study of Language. Cambridge, Mass.: M.I.T. Press, 1964.

Ervin-Tripp, S. M. Discourse agreement: How children answer questions. In J. R. Hayes (Ed.), Cognition and the Development of Language. New York: Wiley, 1970.

Ervin, S., and Miller, W. F. Language development. In H. W. Stevenson (Ed.), *Child Psychology*. Chicago: University of Chicago Press, 1963. Pp. 108-143.

Fillenbaum, S. Psycholinguistics. In P. H. Mussen and M. R. Rosenzweig (Eds.), *Annual Review of Psychology*. Palo Alto, Calif.: Annual Reviews, 1971. Pp. 251-308.

Fodor, E. M. Moral development and parent behavior antecedents in adolescent psychopaths. *Journal of Genetic Psychology*, 1973, 122, 37-43.

Fraser, C. C. Comments in response to McNeill's "The creation of language by children." In J. Lyons and R. Wales (Eds.), *Psycholinguistics Papers*. Edinburgh: University of Edinburgh Press, 1966.

Freud, S. *The Standard Edition of the Complete Psychological Works*. Strachey, J. (Ed.). London: Hogarth Press, 1953-

Friday, N. *My Mother, Myself*, 1977.

Gardner, R. A., and Gardner, B. T. Teaching sign language to a chimpanzee. *Science*, 1969, 165, 664-672.

Gesell, A.

Gesell, A.

Gesell, A.

Gesell, A.

Gesell, A. and Ames, L. B. *Youth: The Years from Ten to Sixteen*. New York: Harper, 1956.

Gesell, A. and Ilg, F. *Infant and Child in the Culture of Today*. New York: Harper, 1943.

Perry, W. G., Jr. Forms of Intellectual and Ethical Development in the College Years. New York: Holt, Rinehart, and Winston, 1968.

Premack, D. Language in chimpanzees? Science, 1971, 172, 808-832.

Quigley, S. P. The deaf student in colleges and universities. In Hardy, R. E. and Cull, J. G. (Eds.), Educational and Psychosocial Aspects of Deafness. Springfield, Ill.: C. C. Thomas, 1974, 95-117.

Quigley, S. P., Jenné, W. C., and Phillips, S. B. Deaf Students in Colleges and Universities, Washington D.C.: Alexander Graham Bell Association for the Deaf, 1968.

Quigley, S. P.

Roe, A. The Psychology of Occupations. New York: Wiley, 1956.

Roe, A. Early determinants of vocational choice. Journal of Counseling Psychology, 1957, 4 (3), 212-217.

Saltzstein, H. D., Diamond, R. M. and Belenky, M. Moral judgment level and conformity behavior. Developmental Psychology, 1971, 7, 327-336.

Schachtel,

Slobin, D.

Slobin, D.

Slobin, D. and Welch, C. A. Elicited imitation as a research tool in developmental psycholinguistics. Unpublished paper, Department of Psychology, University of California, Berkeley, 1967.

Stoodt, B. D. The relationship between understanding grammatical conjunctions and reading comprehension. Elementary English, 1972, 49 (4), 502-504.

Gibbs, J. C. Kohlberg's stages of moral judgment: a critique. In *Stage Theories of Cognitive and Moral Development: Criticisms and Applications*. Reprint No. 13. *Harvard Educational Review*, 1978, 33-51.

Gilligan, C.

Glanzer, M. Grammatical category: A rote learning and word association analysis. *Journal of Verbal Learning and Verbal Behavior*, 1962, 1, 31-41.

Glass, A. Deafness and its effects. In Hardy, R. E. and Cull, J. G. (Eds.), *Educational and Psychosocial Aspects of Deafness*. Springfield, Ill.: C. C. Thomas, 1974, 63-80.

Hall, G. S. *Adolescence*. (Vols. 1 and 2). New York: Appleton, 1904.

Havighurst, R. L. *Developmental Tasks and Education.* (3rd ed.). New York: McKay, 1972.

Heist, P.

Hilgard, J. R. Learning and maturation in preschool children. *Journal of Genetic Psychology*, 1932, 41, 36-56.

Hockett, C. F., and Altmann, S. A. A note on design features. In T. A. Sebeok (Ed.), *Animal Communication*. Bloomington: Indiana University Press, 1968. Pp. 61-72.

Hocking, I. Chomsky and his critics. *New York Review of Books*, 1980, Oct. 25, 27 (16), 47-50.

Hoffman, P. R. Work evaluation: an overview. In Cull, J. G., and Hardy, R. E. (Eds.), *Work Evaluation and Work Adjustment for Rehabilitation Services*. Springfield, Ill.: C. C. Thomas, 1972.

Hollingshead, A. B. *Elmtown's Youth: The Impact of Social Classes on Adolescents*. New York: Wiley, 1949.

Hollingsworth, L. S., *The Psychology of the Adolescent*. Oxford: Clarendon Press, 1929.

Hutson, B. A., and Shub, J. Developmental study of factors involved in choice of conjunctions. Paper presented at the American Educational Research Association Conference, Chicago, 1974.

Jensen, A. R.

Katz, E. W., and Brent, S. B. Understanding connectives. *Journal of Verbal Learning and Verbal Behavior*, 1968, 7, 501-509.

Kohlberg, L. Stage and sequence: the cognitive developmental approach to socialization. In Goslin, D. (Ed.), *Handbook of Socialization Theory*, Chicago: Rand McNally, 1969.

Kuhn, D., Ho, V., and Adams, A. Formal reasoning among pre- and late adolescents. *Child Development*, 1979, 50 (4), 1128-1135.

Lecky, P. *Self-consistency*. New York: Island Press, 1951.

Lenneberg, E. H. Understanding language without the ability to speak. *Journal of Abnormal and Social Psychology*, 1962, 65, 419-425.

Lenneberg, E. H. (Ed.). *New Directions in the Study of Language*. Cambridge, Mass.: M.I.T. Press, 1964 (b).

Lenneberg, E. H. *The Biological Basis of Language*, New York: Wiley, 1967.

Lenneberg, E. H., Nichols, I. A., and Rosenberger, E. F. Primitive stages of language development in mongolism. *In Disorders of Communication*. Baltimore: Williams & Wilkins, 1964. P. 42.

Levy,

Lofquist, L. The general requirements of work. *Journal of Rehabilitation*, 1970, 2, 28-36.

Looft, W. R. Egocentrism and social interaction in adolescence. *Adolescence*, 1971, 6 (24), 487-494.

Lynd, H. M. *On Shame and the Search for Identity*, (2nd ed.). New York: Science Editions Inc., 1965.

Malinowski, B.

Maslow, A. H. Motivation and Personality. New York: Harper Bros., 1954.

Maslow, A. H. The need to know and the fear of knowing. Unpublished paper.

McCarthy, D. Language development in children. In L. Carmichael (Ed.), Manual of Child Psychology. New York: Wiley, 1954.

McGraw, M. B. A Study of Johnny and Jimmy. New York: Appleton-Century, 1935.

McNeill, D. Developmental psycholinguistics. In Smith, F. and Miller, G. (Eds.) The Genesis of Language. Cambridge, Mass.: MIT Press, 19

McNeill, D. The development of language. In P. H. Mussen (Ed.), Carmichael's Manual of Child Psychology. Vol. 1. (3rd ed.) New York: Wiley, 1970. Pp. 1061-1161.

Mead, M. Coming of Age in Samoa

Mussen, P. H., and Conger, J. J.

Mussen, P. H., Conger, J. J. and Kagan, J. Child Development and Personality. (4th. ed.). New York: Harper and Row, 1974.

Muuss, R. E. Theories of Adolescence. (2nd. ed.). New York: Random House,

Neff, W. S. Work and Human Behavior. New York: Atherton Press, 1968.

Neimark, E., and Slotnick, M. S. Development of the understanding of logical connectives. Journal of Educational Psychology, 1970, 61, 451-460.

Newcomb, T.

Pearson, P. D. The effects of grammatical complexity on children's comprehension, recall, and conception of certain semantic relations. Reading Research Quarterly, 1974-75, 10 (2), 155-192.

Penfield, W. and Roberts, L. Speech and Brain Mechanisms. Princeton, N. J.: Princeton University Press, 1959.

Super, D. E., Career Development: Self-Concept Theory. New York, College Entrance Examination Board, 1963.

Thornburg, H. D. Development in Adolescence. Belmont, Calif.: Wadsworth, 1975.

Thorpe,

Trent, J. W., and Medsker, L. L. Beyond High School. San Francisco: Jossey-Bass, 196

Turiel, E., and Rothman, G. R. The influence of reasoning on behavioral choices at different stages of moral development. Child Development, 1972, 43, 741-756.

Tyler, L. E., The Psychology of Human Differences. Second Edition, New York, Appleton-Century-Crofts, Inc.

Tyler, L.E., The development of "vocational interests": I. The organization of likes and dislikes in ten-year-old children. Journal of Genetological Psychology, 1955, 86, 33-44.

Vernon, M. Crises of the deaf. Journal of Rehabilitation, 1971, 1, 31-39.

Von Bonin, C. Architectonics of the precentral motor cortex. In P. C. Bucy (Ed.), The Precentral Motor Cortex. Urbana: University of Illinois Press, 1949.

Wason, P. C. and Johnson-Laird, P. N. Psychology of Reasoning: Structure and Content. London: Batsford, 1972.

Whitaker, H. A. On the Representation of Language in the Human Brain: Problems in the Neurology of Language and the Linguistic Analysis of Aphasia. Working papers in phonetics. No. 12, University of California, Los Angeles, 1969.

Whitaker, H. A. A model for neurolinguistics. Colchester, England: University of Essex, Language Center, 1970.

Wolfram, W. Extended notions of grammar and comprehension. Paper presented at the Preconvention Institute on Reading Comprehension and Syntax, International Reading Association Conference, 1975.

The Role of Deafness and Education in the Moral Development of Hearing-Impaired Children and Adolescents

Mary Field Belenky

It is remarkable that such an extraordinary variation on the human experience as that of deafness has been generally ignored in the ongoing study of human development. Knowledge from research on such variations can make major contributions towards revealing universal processes of development. Knowledge from studies of development in more ordinary populations could be more fully utilized to illuminate the developmental issues of those who share this particular variation in experience. In this paper the processes of moral development of those who have hearing impairments will be explored by addressing several overarching questions. How does early and profound deafness affect the development of moral judgement throughout the life span? What is the relationship between the development of symbolization -- not speech -- and the development of mind and the development of morality? How can the development of moral reasoning be best supported and promoted in those who are hearing impaired? This exploration leads to a deeper appreciation of the role that dialogue plays in the development of all human beings.

Although there is little research that has directly studied moral development in hearing impaired populations, concern with issues of ethical development has been a central focus in developmental psychology for several decades. It is the work of Piaget that has brought about a paradigm shift making this outpouring of research in development and moralization possible (Gardner, 1973; Loevinger, 1976).

The underlying premise of the developmental paradigm is that meaning-making structures pass through a number of discrete stages which can be seen as intra-psychic and self-other organizations; that each new stage is more complex and gives the individual more adequate and equilibrated ways of conceptualizing the environment and the self; that the stages are achieved through constant interaction between the maturing individual and challenging experience, in the context of physical and interpersonal support.

Development in all domains -- cognitive, ethical, and ego-identity -- is seen as progressing from the self toward the world; from egocentricity toward allocentricity; from the simple to the complex; from the diffuse to the differentiated and toward the integration of differentiated components; from the concrete to the abstract; from the impulsive to the rational; from the dualistic to the relativistic; from dependence toward autonomy and interdependence. With the availability of this theoretical framework, American psychologists have turned their attention from an almost exclusive concern with the impact of the environment or stimulus on the seemingly passive child. Now, serious attention can be paid to the ways in which the active child constructs meaning out of his or her experience in the world.

Piaget (1932/1965) conducted one early study on The Moral Development of the Child before confining his attention to the development of logical structures that organize thinking in all domains. He depicted two moralities that children hold: 1) the heteronomous -- or that emanating from adult authority, and 2) the autonomous -- or that which is self-chosen. The youngest children conceptualize rules as being sacred and untouchable, created and imposed by adults, and as lasting forever. Being good is equated with obedience to the will of adult authority. Wrong is to have a will of one's own. Little coordination is found, however, between the young child's conception of the rules with his actual practice. Since they are unable to subordinate their actions to intentions, the behavior of immature children seems impulsive and unpredictable. While the younger child sees rules as external to the mind and incapable of being transformed, the older child comes to think of rules as mutual agreements made between equals which maintain and enhance games and the social order. Piaget believed that it is through the experience of cooperation among peers that the ethic of mutual respect evolves. This "leads, in the domain of justice, to the development of a conception of equality which is the idea at the bottom of distributive justice and of reciprocity." (p. 329). This is an achievement of particular consequence to Piaget with his overriding concern with the development of logic, as he sees the notion of justice as "the most rational of all moral notions" (p. 197). Indeed, he argues that "the important norm of reciprocity (is) the source of the logic of relations (which) can only develop in and through cooperation" (p. 107).

Kohlberg (1969; 1981), expanding on Piaget's work, periodically interviewed a group of males from their adolescence on for over twenty years, asking them how they would best resolve a series of hypothetical moral dilemmas. From their responses, Kohlberg delineated a series of six qualitatively distinct and hierarchically arranged stages of moral reasoning that arise in an invarient sequence. Kohlberg's description of moral development, like Piaget's, focuses on the development of conceptions of rules and, ultimately, on the evolution of universal principles of justice. Each stage represents an increasingly adequate mode of resolving dilemmas posed by competing claims and rights of individuals who are conceived of as equals.

Kohlberg groups these six stages into three broad levels: preconventional, conventional, and postconventional -- or principled judgements. Young children reason at the preconventional level in which right and wrong are defined in terms of physical consequences to the self. Those who reason at Stage 1 have a punishment and obedience orientation. Good is equated with obedience and avoidance of punishment by powerful authorities. Stage 2 is characterized by a naive hedonism. The good is that which satisfies one's own needs and feelings of others will be considered to the extent that such considerations are seen as benefitting the self.

"Tit for tat" suggests the basis for this thinking which has achieved some liberation from adult constraint. As adults are no longer seen as omnipotent, the interests of the self can be asserted more fully. While preconventional reasoning is ordinarily transcended in early adolescence, there is some evidence (to be discussed in greater detail) which suggest that hearing impaired students entering college are still typically at these early stages of development. Preconventional adolescents delayed in development are still under the influence of internal and external physical stimuli, rather than that of symbolic representations conceptualizing past and future roles and values which have been shared and self-examined. The adolescent who continues to consider only his or her own immediate needs and wishes when resolving moral conflicts is, by definition, egocentric, impulsive, unable to delay gratifications or to coordinate actions with either long term plans or shared norms and values.

At the conventional level, Stage 3 is defined by a "good boy" orientation where good is that which pleases and helps others and which keeps the self in their good graces. Sharing in the values of those whose good regard one seeks becomes important because one's self esteem and emerging identity are dependent on being accepted and well liked. Conforming to group pressure and expectations is typical of adolescents at Stage 3 while age mates who are still preconventional or those who reason at the more advanced stages exhibit little conformity behavior (Saltstein et al, 1972). Shared values are increasingly held because they serve to enhance the lives of those whom one cares about and has come to feel responsible towards. Commitment to community standards becomes important because conformity is seen as benefitting others as well as enhancing the self image. Moral reasoning at the conventional level requires an increased capacity for abstract thought and role-taking which allows the individual's thinking to stretch outwards into another's perspective and outwards toward the future. With such a capacity, one's actions can become guided by a concern for others as well as by shared goods and values. At this juncture, both the concepts "should" and "love" enter the vocabulary and become central to the moral dialogue. Indeed, it is at this point in the developmental progression that vocabularies and dialogue themselves seem central to the moral process -- although these must have been present in more rudimentary form from the very beginning.

At Stage 4, the individual is able to take the perspective of the society. Norms, laws, and legitimate authorities are now respected, as it is now understood that these are essential functions for maintaining the social order.

At the postconventional stages, universal principles evolve as the standard for assessing societal norms, contracts, and constitutional agreements, as well as for guiding individual moral choice. Principles derive their value through appeal to logical comprehensiveness, universality and consistency. They are principles of justice, of reciprocity and equality, of human rights. Principled thinking is notably rare. It appears, if at all, in very late adolescence or during the adult years.

Gilligan (1977, 1979, 1982) has generated a critique of our current understanding of moral development as shaped by Piaget's and Kohlberg's work. She argues that Kohlberg's (1969) basic research on moral development, like much of Piaget's (1932/1965) and much of the empirical research on adolescent development (Adelson, 1980), has been conducted largely on male samples, and that this tendency to select male samples has resulted in a description of the life cycle that primarily depicts male experience, male standards, and the evolution of those personal qualities that have been relegated to that sex. Gilligan argues that when one studies women making serious moral choices across the life span (Belenky, 1978; Gilligan, 1977, 1979, 1982; Gilligan and Belenky, 1980), one finds a different conception of morality unfolding -- one that is centered on relationships, care, and responsibility. While women's conception of morality more typically centers on issues of responsibilities, the moral conception Piaget and Kohlberg described is organized around issues of rights. The rights orientation seeks justice for individuals in an egalitarian context. The responsibility orientation seeks mercy which recognizes the inherent inequalities between persons and the need to be cared for and to care. The responsibility orientation rejects the notion that justice should be blind and argues for always knowing the context for moral choice. Undoubtedly, an integration of these two conceptions -- the morality of responsibility and the morality of rights -- provides a fuller understanding of the human potential, and the highest stages of development might ultimately be found to reflect a higher degree of differentiation and integration of conceptions of both self and other; individuality and interdependence; agency and communion; and rights and responsibilities. Both of these orientations to morality should be kept in view when considering the role of deafness and education in the moral development of the hearing impaired.

The DeCaro's and Emerton (DeCaro and Emerton, 1978; DeCaro, Emerton, and DeCaro, 1983) have conducted the only study to assess levels of moral reasoning in the hearing impaired. They studied moral judgments of students at a selective, technical college for the deaf. A handwritten form of Kohlberg's instrument was administered to the entire freshman class in 1975 and to 44 randomly selected subjects in 197[illegible]. Both groups of freshmen were scored predominantly at the preconventional level. Preconventional moral reasoning is infrequent in all the other college populations that have been studied to date. To rule out the possibility that such low functioning could be attributed to difficulties in writing, they randomly selected 10 freshmen in 1977 who were administered the handwritten form as before. These students were also interviewed in person by an adult who was highly skilled in manual forms of communication and who is widely regarded as being in excellent communication with hearing impaired students. Manual and oral modes of communication were used simultaneously in these interviews, which were recorded by video tapes and then translated into standard English and transcribed. The stage scores from the written and interview data that were collected from these 10 students were similar. As a group, their scores also closely paralleled the profiles obtained from the previous samples. Four years later, extraordinary effort was made to locate and re-interview all ten of these subjects. Again, both handwritten and face-to-face video recorded interviews were collected. All four data sets -- the written and interview versions from both 1977 and 1981 -- were scored simultaneously and blindly by an expert scorer from the Harvard Center for Moral Education. In 1977, all 10 were reasoning at the preconventional level. All were scored predominantly at Stage 2. Only four showed some strong evidence of Stage 3 -- the first appearance of conventional moral reasoning according to Kohlberg's scheme. Four years later, all showed a substantial amount of Stage 3 conventional moral reasoning with only four still using a great deal of thought characteristic of Stage 2. The gain was significant at the .001 level and suggests that delayed development can be overcome relatively late in the life cycle.

While the progress of these students seems important and promising, it is the case that their moral judgement scores are still low when compared with studies of hearing college students. It is possible that these depressed scores are an artifact of the dilemmas that make up the Kohlberg interview and that these students have actually made greater progress than indicated. To be scored at Stage 4 or higher on Kohlberg's scheme, the interviewee must indicate that he or she has taken the perspective of the society as a whole. Young adults who feel excluded from the hearing world may not take a societal perspective when the moral dilemma is depicted as occurring in the larger society. These same adults may, however, use much more complex reasoning when resolving dilemmas that are depicted as occurring within the deaf community. It is hoped that the DeCaro's and Emerton will add such dilemmas in subsequent follow-ups of this same sample, ruling out that source of bias. Levine (1981) stresses the importance of studying the hearing impaired in their own environments if we are to move beyond negative stereotypes.

Be that as it may, the elaborate video recorded interviews used by the DeCaro's and Emerton are unprecedented in the studies of the hearing impaired. This is surprising, as Vernon (1967) and Furth (1964, 1966), in reviewing the research literature on the development of intelligence in the hearing impaired, found considerable evidence that the verbal nature of most psychological tests systematically disadvantages hearing impaired subjects. When children are assessed by non-verbal means, their level of cognitive function is more like that of their hearing peers. That the subjects of DeCaro's and Emerton were able to avoid written tests which are problematic for many hearing impaired and were able to choose the mode of communication in which they were most proficient, undoubtedly helped them demonstrate the complexity of their moral judgement. However, the Kohlberg measure does rest on a linguistic dialogue and leaves many questions to be considered. How much does morality itself depend on a dialogue between persons that presupposes a shared symbol system? Are hearing impaired adolescents actually delayed in moral development or do they just perform poorly on the Kohlberg instrument?

The available literature, comparing hearing impaired and normally hearing children, repeatedly suggests a delay in psycho-social development among the hearing impaired, lending some validity to the DeCaro's and Emerton's findings. Hearing impaired children are consistently characterized as more impulsive and/or egocentric than their normally hearing peers (Altshuler, 1963, 1974; Harris, 1978; Hefferman, 1955; Hoemann, 1972; Levine, 1956; McAndrew, 1948; Meadow, 1980; Rainer et al, 1966; Rodda, 1974; Schein, 1968, 1975; Schlesinger and Meadow, 1972).

The literature that reaches this consensus on the psycho-social immaturity of the hearing impaired has been mostly generated on samples of children and adolescents. When adults are studied, they are frequently from clinic populations in which one might expect to find a disproportionate amount of psychological problems. Furth (1973) summarizes the relatively few studies on non-clinical populations of hearing impaired adults, who are otherwise normal. This literature depicts these adults as highly gregarious, active, responsible participants in a closely knit, stable community of the deaf. Through the use of sign, all members of this community are able to be in good communication with one another. These communities have a rich array of social organizations that effectively work towards meeting the needs of a group that has been consistently handicapped by the nature of their relations with the broader community. That hearing impaired adults tend to be full, responsible participants in community life suggests that even though moral development may be delayed, it is not truncated. Furth suggests that the repeated finding of a high incidence of pathology among deaf children and low incidence of disturbance among deaf adults may be accounted for by a developmental lag that has no lasting consequences for the emotional life of the adult. Levine (1981) observes that as a group the hearing impaired are remarkably resilient and successful in coping with adult demands despite difficult childhoods. The longitudinal findings of the Decaro's and Emerton also provide some support for Furth's hypothesis.

Lacking other studies on the moral development of hearing impaired children and adults, we must rely on a myriad of findings that provide only indirect evidence for discerning patterns of moral development in hearing impaired populations. Lickona (1976) in reviewing the literature on moral development as conceptualized by Piaget and Kohlberg, comes to the conclusion that there are three factors that generally promote moral growth: cognitive development, liberation from the coercive constraint of adult authority, and social interaction. We will look at the implications of each of these factors in respect to hearing impaired children. All the studies to be cited have used Kohlberg's scheme as an index of development unless otherwise indicated.

Cognitive Development and Moral Reasoning

Colby (1973), Kohlberg (1969), Kohlberg and DeVries (1969), Kuhn, Langer, Kohlberg, and Haan (1977), and Tomlinson-Keasey and Keasey (1974) have demonstrated that for each moral stage identified, there is a corresponding logical stage or substage as defined by Piaget. These cognitive stages were found to be a necessary, but not sufficient condition for the occurance of the moral stage. Mature moral reasoning requires mature cognitive functioning. However, mature cognitive functioning does not automatically assure maturity in moral reasoning.

While Furth (1964, 1966) and Vernon (1967) have gathered considerable evidence that the early stages of cognitive development Piaget describes are not delayed in hearing impaired children when assessed by non-verbal tests, the evidence is not so clear for normal development of formal operational thought in adolescence. If hearing impaired adolescents are unusually delayed in achieving the capacity for abstract, formal thought, that delay could contribute to the unusually low levels of moral reasoning in the college students observed by the DeCaro's and Emerton.

Liberation from Adult Constraint

The second condition for moral development to be considered is the process by which the child who begins life as a very small and powerless person among giants, comes to have a sense of equal responsibility for framing and resolving moral problems and of equal worth in making moral claims. Because parents are usually the most important authorities in the lives of children, the research literature on the impact of parental discipline techniques on children's moral development will be examined. Hoffman and Saltstein (1967) looked at the relationship between parent's discipline and their children's maturity of moral judgement. They distinguished three types of discipline: 1) Power Assertion -- or the exercise of physical power over the child; 2) Love Withdrawal, defined as the expression of anger and the withholding of affection; and 3) Induction, which primarily involves pointing out the consequences of the child's behavior for others. They defined two levels of moral maturity: the high externals who conceptualized moral issues in terms of rewards and punishment vs. those who had internalized moral values. Their definitions correspond closely to Piaget's two styles of moral judgement and to Kohlberg's preconventional and conventional levels of moral reasoning. High internalization of moral values was strongly correlated with induction as a disciplinary technique. Parents using high induction point out the harmful consequences of the child's behavior and encourage discussions about the range of motivations and issues involved. Morality based on the fear of external punishment was associated with power assertive techniques such as using physical punishments and withdrawal of privileges. These findings were generally corroborated in reviews of the extensive literature on childrearing practices (Baumrind, D., 1980 and Hoffman, 1977). Holstein (1968) studied families as they actually discussed hypothetical moral dilemmas. Children who were most advanced in moral reasoning on Kohlberg's scale had parents who encouraged a dialogue on the range of issues involved in the dilemma. These parents were effective in drawing out their childen's opinions which appeared to be valued even when the opinions departed from those of the parents. The parents who failed to generate a dialogue and who demanded high conformity to their own opinions had the least morally mature children.

Parikh (1975) replicated Holstein's study in India, obtaining similar results. Haan, Smith, and Block (1968) analyzed differences in perceptions of parental relationships among large samples of college students and Peace Corps volunteers who were at various stages of moral judgement as measured by Kohlberg's interview. They found that the principled students were more apt to describe their parents as being neither permissive nor laissez-faire, but as being actively involved in their lives, and as argumentative -- even conflict inducing -- for thorough and often heated discussions of all differences and decisions were customary in their families. Conventional level students described their families as harmonious, with little parent-child conflict. They depicted their parents as using clear rules, reinforced by rewards and punishments rather than encouraging discussion and debate around value differences. These studies suggest that parents' willingness to reduce the power differential between themselves and their children, along with their ability to sponsor productive and rational discussions about moral conflicts are important factors in fostering moral development in children.

Several studies suggest that parents of hearing impaired children are more likely to use power assertive discipline techniques than are parents of normally hearing children (Chess, 1975; Collins, 1969; Goss, 1970; Mindel and Vernon, 1971; Schlesinger and Meadow, 1972). Schlesinger and Meadow (1972) describe mothers of hearing impaired children as being more controlling, didactic, and intrusive. They are less likely to delegate decision making responsibilities to the child. Physical punishments and restraints are much more likely to be seen as effective. The early need of a parent to intervene physically persists late into childhood as discussion and explanation, or inductive techniques, are extremely difficult without a shared, effetive system for communication between parent and child. That adult constraint remains such an important factor in the lives of hearing impaired children may be another important factor accounting for the delay found in the development of moral reasoning.

Social Interaction and Moral Development

Piaget (1932/1965) argued that the development of moral reasoning "presupposes a long reciprocal education of the children by each other" (p. 318) as the notion of justice "requires nothing more for its development than the mutual respect and solidarity which holds among the children themselves" (p. 198). Kohlberg, not discounting the importance of peer relations, argues that moral development depends on having a wide range of role-taking opportunities in a variety of social institutions. That the development of these stages of moral reasoning is tied to the expanding capacity for social role-taking has been richly demonstrated by Selman (1971). Hollos and Cowan (1973) assessed the impact of social isolation on the development of logical capacities and on role-taking abilities in young children. They selected Norwegian children from farm, village, and town families who were otherwise matched for socio-economic status, family size and child rearing practices. Hollow and Cowan argue that the children in the different social settings differed primarily in the opportunity to be involved in verbal and social interaction with peers. The farm children performed as well or better on the logical tasks but had lower role-taking scores than the village and town children, who did not differ one from another. The Norwegian study suggests that social isolation had a retarding effect on the development of the capacity for role-taking, a central aspect of psycho-social development. The importance of social interaction was further supported by Keasey (1971) who demonstrated a relationship between moral maturity (MMS) and high social participation. The more mature students were most likely to be chosen as leaders and friends by their peers. Thrower (1971) compared adolescents who had been raised in institutions with those placed in foster homes as well as those who remained in their own disturbed family. Those raised in institutional settings were still at the very earliest stages of moral reasoning, while the other groups were closer to the expected levels of development for their age. Thrower described the social relations in the orphanages as highly fragmented, with little communication among the children themselves or between the children and the staff. These children consistently failed at role-taking tasks which presented the control groups no difficulty. These findings lend strong support to the importance of social interaction in moral development.

Hearing impaired children suffer a degree of social isolation that would be unusual to find in other groups. Stokes (1945) and Brunschwig (1936) conducted studies which showed that deaf children have fewer playmates and engage more in solitary play than do their hearing peers. Accounts of hearing impaired adults whose childhood experiences were confined to the hearing community are riddled with descriptions of isolation and loneliness, even in the midst of their own families. Until recently, educators of the hearing impaired were predominantly committed to developing the oral-aural modes of communication. Gestures and signs were prohibited and sometimes even reading and writing were discouraged, as these were thought to inhibit the development of oral skills (Meadow, 1980; Moores, 1978). Even with extensive oral training, the speech produced by most prelingually deaf people is typically hard to understand (Nickerson, 1975). The difficulties involved in lip reading make the comprehension of spoken words most problematic (Lowell, 1959). Given the poor language base, deafness from an early age is associated with serious problems in learning to read and write (Furth, 1966; Brooks, 1978). Signed language is the most efficient and easily learned mode of communication available to the hearing impaired. If sign is not available, these children have severly limited access to language and social discourse. Schlesinger and Meadow (1972) observed that mothers of deaf children, having been warned of the dangers of introducing their children to sign, used gesture to communicate with their children only slightly more than mothers of hearing children. Only 4 out of the 40 mothers in their sample decided to learn sign so they might communicate easily with their own children. Typically, sign was learned surreptiously from other children when a child was placed in special schools for the deaf or later in life when access to the deaf community is gained. Reich and Reich (1973) found that the average age for learning to sign was 13.7 years for those attending day schools and 7.11 years for those placed in residential programs. Hoemann (1972) found that eight to eleven-year old children in a residential school were only beginning to acquire sign. The major exception to these trends has been the small proportion of deaf children born to deaf parents. These children, growing up in a sign-rich environment, easily learn a mode of communication at the same age or even earlier than hearing children acquire language (Schlesinger, 1978). Being unable to produce understandable speech, unable to comprehend much of the spoken language, unable to read and write well, unable to sign, the hearing impaired child experiences an unprecedented degree of social isolation. Such isolation was poignantly illustrated by a college student who had attended his father's funeral. Although this student was literate and written messages were possible, no attempts were made by relatives or friends to communicate with him. He returned to college without knowing even the cause and circumstances of his father's death. If social participation is an important contributor to moral development, it would follow that development would be delayed in those who do not have access to an efficient language and who are excluded from the give and take of an ongoing dialogue.

The importance of the early access to language and the introduction of sign as an effective mode of communication for hearing impaired children is suggested by studies comparing deaf children born to deaf parents with those born to normally hearing parents. These studies have generally agreed that the children born to deaf parents tend to be more advanced in many aspects of linguistic competence, academic achievement, and/or psychosocial development (Brasel and Quigley, 1975; Corson, 1973; Harris, 1978; Meadow, 1968;

Schlesinger and Meadow, 1972; Stevenson, 1964; Stuckless and Birch, 1966; Vernon and Koh, 1970). Schlesinger and Meadow (1972) found deaf children of deaf parents to have higher ratings on their measures of responsibility, maturity, and independence. Although there is continued debate over whether access to sign accounts for these striking differences, there are several studies that suggest that easy access to language is at least one important condition for many aspects of development. Harris (1978), in one of the few studies exploring the relationship between the age of exposure to manual communication and subsequent development, found that the younger the age the child was exposed to sign, the greater the impulse control. Impulse control, we have argued, is an important index of moral maturity. Meadow (1972) found that hearing impaired children with good language skills, were more like normally hearing children than were those with poor skills, in terms of being happy, enjoying interaction, compliance, mastery, and creative imagination. Without access to language the child would have difficulty referring to concrete objects that were not immediately present. Collins (1969), Heider and Heider (1940), and Schlesinger (1972) found that the communications of deaf children were almost exclusively confined to topics with a visual referent. Without language the child has a limited metaphorical capacity to depict and share with others such internal events such as thinking and ideas, motivation and intentions, values and commitments. They lack the metaphoric capacity to envision, depict, and share conceptions of the future as well. As Harris argues (1978), impulse control depends on the capacity to plan ahead in a careful and organized manner so that gratification of immediate needs and wishes can become secondary to the achievement of long term goals. Preconventional moral judgements seldom draw on abstract metaphorical thought as this moral view is confined to the felt needs of the self and to the concrete consequences of action on the self. Conventional and principled moral judgements, however, require considerations of complex phenomena seen from many perspectives. Some sort of shared symbol system must be available if such notions are to be captured and communicated.

The social isolation and the lack of interpersonal interaction experienced by hearing impaired children seem to be further exacerbated by the kinds of school experiences that have been provided for them until recently. Thrower's findings of depressed moral development scores in children reared in institutions may have serious implications for the hearing impaired, as a large percentage of such children have been educated in residential settings. Schools for hearing impaired have been described as overwhelmingly dominated by the teachers, while the children remain highly passive (Craig and Collins, 1970; Furth, 1973; Hawkins, 1966). Craig and Collins (1970) found that 80% of the classroom communication was teacher generated, while only 3% was initiated by the students. Even when students did initiate communication the teachers typically failed to respond. Even given these problems, the current practice of mainstreaming children with hearing impairments into regular schools may actually prolong the period of social isolation that deaf children experience. If the teachers and students in regular schools do not take responsibility for learning sign, the mainstreamed child may not learn an effective system for communicating until she or he reaches adulthood and finds a way into the deaf community.

If the opportunity to participate in an ongoing dialogue is essential for the development of moral reasoning, how deaf children communicate may not be significant, as long as they do. Oral speech is only one possible form of communication, although speech and language have been traditionally equated. Fraiberg (1977) has demonstrated the importance for blind children of finding alternative routes for functions that ordinarily require the use of vision. Once other paths are found, development proceeds well. Without such a rerouting, development is likely to be seriously truncated. The give and take of interchange and dialogue, made possible by the use of language -- in whatever mode -- is likely to be the central experience that is essential for moral development.

The preceding analysis suggests that deaf children who are reared in a sign-rich environment, with a high rate of social interaction and extended opportunities for dialogue, may be more like hearing children in their development of moral reasoning. We (Belenky, 1982; Belenky, Clinchy, Goldberger and Tarule, forthcoming) have found that hearing adolescents and adults who grew up in environments with markedly limited opportunities for dialogue may have developmental patterns that are more like those of the typical person who is hearing impaired. The small number of the 150 women studied who were still at the preconventional level of moral development, as measured by Kohlberg and Gilligan, had a number of factors in common: their families were unusually hierarchical, with a very unequal distribution of power between the parents and between the adults and the children. There was little discussion among family members. Without recourse to "thinking and talking things out" together, physical coercion was common in their families. For one reason or another, these hearing adolescents and women seldom had friends while growing up. As children they were seen but not heard. As children they lacked the freedom from adult constraint and the experiences of social participation that Lickona argues are necessary for moral development. Growing up in isolation seems to pose grave danger for cognitive development as well -- the third condition necessary for moral growth. These few hearing adolescent and adult women in our study who were still at the preconventional stages of moral development also had very primitive conceptions of the nature of knowledge and of themselves as knowers. While they viewed truths as emanating from the words of authorities, they had little confidence in their own abilities to receive, remember, and recite such words. Memorizing and returning the words of teachers was, in their minds, the way one learns even though they did not believe that they themselves had the capacity to learn from words. They had no sense of constructing truths from their own experience, through the use of their own minds. They had little sense of their own voice as a tool for mediating and communicating experience with others.

Vygotsky (1962 and 1977) and Luria (1961 and 1979) demonstrate that many exterior dialogues are a necessary precursor to inner speech and an awareness of one's own thought processes. Without conversation -- listening to others and the drawing out of one's own voice -- the individual fails to develop a sense that she, herself, can think. Luria (1961) traces the long process that the young child undergoes before the child's actions can become subordinated to and guided by the verbal commands of others. Only later is the child able to represent directions and commands to her own self. With the development of a sufficient symbol system the child can talk to herself. Through inner speech the individual can make plans, reflect on and revise them, and then act in accordance with such plans. With inner speech the individual's behavior is no longer controlled by immediate stimulus. Our data shows how hearing adolescent and adult women continue to develop a sense of their own voice and their own mind well into the adult years. Only at the highest stages of moral and epistemological development is the self conceptualized as being fully capable of and responsible for the construction of knowledge. It is only then that the capacity for dialogue appears to be fully developed. Moral growth can continue and accelerate through the adult years for those whose developmental progress has conformed to normal patterns and for those who have serious delays to overcome.

The accumulated evidence corroborates Emerton et al's (1979) conclusion that developmental delays experienced by those who are hearing impaired may be more a function of the ways the deaf are educated than of deafness itself. Children with early and profound hearing loss typically experience serious and continued social isolation; are often subjected to non-rational, power assertive discipline techniques by their teachers and parents; are often discouraged from participating in the give and take of on-going dialogues in both school and home; and are delayed in the acquisition of the higher stages of cognitive functioning. To be disadvantaged in these respects has serious implications for moral development and could account for the developmental delay observed in the hearing impaired. All of these seem to be conditions that are often ameliorated through participation in the social life of the deaf community during adulthood. All seem to be conditions that could be reversed earlier through the systematic provision of well designed social and educational experiences that sponsor fuller and more adequate modes of functioning. Kagan (1973) has begun to document a variety of circumstances in which the developmental effects of serious deprivation have been reversed. His work suggests that the human organism is more adaptable and resilient than had heretofore been thought possible for developmental deficits to be made up late into the life span. The longitudinal findings of the DeCaros and Emerton document the ability of adolescents and adults to greatly overcome the developmental delays imposed by the experiences that children who are deaf commonly share. Increasingly, educators understand the importance of making all modes of communication available to the hearing impaired, and have brought about extensive educational reforms, providing more experiences for supporting the development of the capacity for dialogue, hopefully thus preventing and overcoming such developmental delays.

Integrating the understanding about moral development achieved by Gilligan, Kohlberg, and Piaget, suggests that special efforts should be made to provide many opportunities for dialogue within the contexts of two broad types of social experience. The first would aim at promoting the rights orientation of moral reasoning as described by Kohlberg and Piaget. This should involve extensive participation in the governance of fairly complex and sizable democratic institutions where the central moral conflicts would be fully debated and where taking a community or societal perspective is encouraged. Challenging intellectual study should be integrated with these experiences to insure that the quality of participation and the governance structure itself would be on a high level, and to encourage the students to explore the moral, societal, and philosophical implications of their experience. The second kind of experience would aim at promoting the responsibility orientation as depicted by Gilligan. This should involve working with others in a more personal context where such qualities as care, responsibility, and understanding are essential and reciprocated./ Sprinthall (1980) and his colleagues have designed a series of such programs which combine experience in peer counseling and peer teaching with high-level academic study in the social sciences. These programs have had a major impact in moral and ego development of the adolescent participants. These two kinds of experiences should stimulate the development of an expanded conception both of universal, impersonal relationships, and of particular relationships involving the most personal of commitments. As the complexity of modern society increases, the easy access that children have to both of these kinds of experiences appears to decrease. Access for children with special handicaps is likely to be even more problematic. Placing both kinds of experience at the center of a serious academic curriculum is likely to be humanizing for both our children and for our institutions.

Adelson, J. (ed.). The handbook of adolescent psychology. New York: Wiley, 1980.

Altshuler, K.Z. Personality traits and depressive symptoms in the deaf, T. Wortis (Ed.), Recent Advances in Biological Psychiatry, Vol. 6. New York: Plenum Press, 1963, p. 63-73.

Altshuler, K.Z. The social and psychological development of the deaf child: problems, their treatment and prevention, American Annals of the Deaf, 1974, 117, p. 365-376.

Barker, R. Adjustment to physical handicaps and illness. New York: Social Science Research Council, 1953.

Baumrind, D. New directions in socialization research, American Psychologist, 1980, 35, 7, p. 639-652.

Belenky, M. F. The role of dialogue in human development and in the reduction of family violence. Paper presentation, Teachers College, Columbia University, 1982.

Belenky, M. F. Conflict and development: a longitudinal study of the impact of abortion decisions on moral judgements of adolescent and adult women. Doctoral dissertation, Harvard University, 1978.

Belenky, M. F., Clinchy, B., Goldberger, N., & Tarule, J. M. The still small voice: the development of Women's ways of Knowing, New York: Basic Books, forthcoming.

Belenky, M. F., Tarule, J. M., & Landa, A. M. (Eds.) Education and development: the role of schools in ego-identity and moral development in normal and troubled adolescents. Washington, D.C.: Teacher Corps, 1979. (Available through the Moral Education and Research Foundation, Harvard University.)

Brasel, K. E. and Quigley, S. P. The influence of early language and communication environments on the development of language in deaf children. Urbana: University of Illinois, 1975.

Brooks, P. H. Some speculations concerning deafness and learning to read, in Liben, L. (Ed.) Deaf children: developmental perspectives. New York: Academic Press, 1978.

Brunschwig, L. A study of some personality aspects of deaf children. New York: Teachers College, Columbia University, 1936.

Chess, S. Behavior problems of chidren with congenital rubella, in D. Naiman (Ed.) Needs of emotionally disturbed hearing impaired children. New York: New York University School of Education, 1975.

Colby, A. Logical operational limitations on the development of moral judgement. Doctoral dissertation, Columbia University, 1972.

Collins , J. L. Communication between deaf children of pre-school age and their mothers. Doctoral dissertation, University of Pittsburgh, 1969.

Corson, H. J. Comparing deaf children of oral deaf parents and deaf parents using manual communication with deaf children of hearing parents on academic, social, and communication functioning. Doctoral dissertation, University of Cincinnati, 1973.

Craig, W. and Collins, J. Analysis of communicative interaction in classes for deaf children. American Annals of the Deaf, 1970, 115, p. 79-85.

DeCaro, P. A. and Emerton, R. G. A cognitive developmental investigation of moral reasoning in a deaf population. Paper presented at American Educational Research Association meeting, Toronto, 1978 . ERIC #154-572.

DeCaro, P. A., Emerton, R. G., and DeCaro, J. J. A longitudinal investigation of the development of ethical reasoning in a population of young deaf adults. Paper presented at the North American Conference on the Education of the Hearing Impaired, Winnipeg, Canada, June, 1983.

Emerton, G., Hurwitz, T., and Bishop, M. Development of social maturity in deaf adolescents and adults, in Hearing and Hearing Impairment, (Eds.) Bradford, L., and Hardy, W., New York: Grune and Stratton, Inc., 1979.

Fraiberg, S. Insights from the blind. New York: Basic Books, 1977.

Furth, H. G. Research with the deaf: implications for language and cognition. Psychological Bulletin, 1964, 62, p. 145-164.

Furth, H. G. Thinking without language: psychological implications of deafness. New York: The Free Press, 1966.

Furth, H. G. Deafness and learning: a psychological approach. Belmont, California: Wadsworth, 1973.

Gardner, H. The quest for mind: Piaget, Levi-Strauss, and the structulralist movement. New York: Knopf, 1973.

Gilligan, C. In a different voice: women's conceptions of the self and of morality. Harvard Education Review, 1977, 47, p. 481-517.

Gilligan, C. Women's place in man's life cycle. Harvard Educational Review, 1979, 49, 4, p. 431-447.

Gilligan, C. In a different voice: psychological theory and women's development. Cambridge: Harvard University Press, 1982.

Gilligan, C. and Belenky, M.F. A naturalistic study of abortion decisions, in R. L. Selmand & R. Yando (Eds.) New directions for child development: clinical-developmental psychology. San Francisco: Jossey-Bass, 1980.

Coss, R.N. Language used by mothers of deaf children and mothers of hearing children, American Annals of the Deaf, 1970, 115, p. 93-96.

Haan, N., Smith, M. and Block, J. Moral reasoning of young adults: political-social behavior, family background, and personality correlates. Journal of Personality and Social Psychology, 1968, 10, 3, p. 183-201.

Harris, R. I. The relationship of impulse control to parent hearing status, manual communication and academic achievement in deaf children. American Annals of the Deaf, 1978, p. 52-66.

Hawkins, F. P. The logic of action: from a teacher's notebook. Denver, Colorado: Elementary Science Advisory Center, 1969.

Hefferman, A. A psychiatric study of fifty preschool children referred to hospital for suspected deafness, in Caplan, G. (Ed.) Emotional problems of early childhood. New York: Basic Books, 1955.

Heider, F. and Heider, G. M. Studies in the psychology of the deaf, No. 1. Psychological Monographs, 1940, 52, p. 232.

Hoemann, H. W. The development of communication skills in deaf and hearing children. Child Development, 1972, 43, p. 990-1002.

Hoffman, M. Moral internalization: current theory and research. In L. Berkowitz (Ed.), Advances in experimental social psychology (vol. 10). New York: Academic Press, 1977.

Hollos, M. and Cowan, P. A. Social isolation and cognitive development: logical operations and role taking abilities in three Norwegian social settings. Child Development, 1973, 44, p. 630-41.

Holstein, C. B. Parental determinants of the development of moral judgement. Doctoral dissertation, University of California at Berkeley, 1968.

Kagan, J. Cross-cultural perspectives on early development. American Psychologist, 1973, 28, 11, p. 947-1102.

Keasey, C. B. Social participation as a factor in the moral development of preadolescents. Developmental Psychology, 1971, 5, p. 216-222.

Kohlberg, L. Stage and sequence: the cognitive developmental approach to socialization. In D. A. Goslin (Ed.) Handbook of socialization theory and research. Chicago: Rand, 1969.

Kohlberg, L. Moralization, in T. Lickona (Ed.) *Moral development and behavior*. New York: Holt, Rinehart & Winston, 1976.

Kohlberg, L. *The philosophy of moral development*. New York: Harper and Row, 1981.

Kohlberg, L. and Mayer, R. Development as the aim of education, *Harvard Education Review*, *42*, 1972.

Levine, E. S. *Youth in a soundless world*. New York: New York University Press, 1956.

Levine, E. S. *The ecology of early deafness*. New York: New York University Press, 1956.

Lickona, T. Research on Piaget's theory in moral development, in T. Lickona (Ed.) *Moral development and behavior*. New York: Holt, Rinehart & Winston, 1976.

Loevinger, J. *Ego development: conceptions and theories*. San Francisco: Jossey-Bass, 1976.

Lowell, E. Research in speech reading: some relationships to language development and implications for the classroom teacher. Proceedings of the 39th meeting of the American Instructors of the Deaf, 1959, p. 68-73.

Luria, A. R. *The role of speech in the regulation of normal and abnormal behavior*. New York: Boni & Liveright, 1961.

Luria, A. R. *The making of mind: a personal account of Soviet psychology*. Cambridge, Mass: Harvard University Press, 1979.

Luria, A.R. and Yudovich, F. *Speech and the development of mental processes in the child*. Middlesex, England: Penguin, 1971.

McAndrew, H. Rigidity and isolation: a study of the deaf and the blind, *Journal of Abnormal and Social Psychology*, 1948, *43*, p. 476-494.

Meadow, K. P. Early manual communication in relation to the deaf child's intellectual, social, and communicative functioning. *American Annals of the Deaf*, 1968, *113*, p. 29-41.

Meadow, K. P. Sociolinguistics, sign language and the deaf sub-culture. In T. O'Rourke (Ed.) *Psycholinguistics and total communication: the state of the art*. Washington, D.C.: American Annals of the Deaf, 1972.

Meadow, K. P. *Deafness and child development*. Berkeley: University of California, 1980.

Mindel, E. D. and Vernon, M. They grow in silence: the deaf child and his family. Silver Spring, MD: National Association of the Deaf, 1971.

Moores, D. F. Educating the deaf: psychology, principles and practices. Boston: Houghton, Mifflin, 1978.

Nickerson, R. Characteristics of the speech of the deaf. (Report No. 3016). Cambridge, MA: Bolt, Beranek & Newman, 1975.

Parikh, B. Moral judgement development and its relation to family environmental factors in India and the United States. Doctoral dissertation, Boston University, 1975.

Piaget, J. The moral judgement of the child. New York: Free Press, 1965. (First published in London: Kegan Paul, 1932.)

Rainer, J. D. and K. Z. Altshuler. Comprehensive mental health services for the deaf. New York: New York Psychiatric Institute, Columbia University, 1966.

Reich, P. and Reich, C. A. A follow-up study of the deaf. Unpublished manuscript, University of Toronto, 1973.

Saltstein, H. D., Diamon, R. M., and Belenky, M. F. Moral judgement level and conformity behavior. Developmental Psychology, 1972, 7, 3, p. 327-336.

Rodda, M. Behavioral disorders in deaf clients. Journal of Rehabilitating of the Deaf, 1974, 7, p. 1-13.

Schein, J. D. Deaf students with other disabilities. American Annals of the Deaf, 1975, 120, p. 92-99.

Schein, J. D. The deaf community: studies in the social psychology of deafness. Washington, DC: Gallaudet College Press, 1968.

Schlesinger, H. S. Meaning and enjoyment: language acquisition of deaf children. In T. J. O'Rourke (Ed.), Psycholinguistics and Total Communication: The State of the Art, Washington, DC: American Annals of the Deaf, 1972, p. 92-102.

Schlesinger, H. and Meadow, K. Sound and sign: childhood deafness and mental health. Berkeley, Cal: University of California Press, 1972.

Selman, R. L. The relation of role-taking to the development of moral judgement in children, Child Development, 1971, 42 p. 79-91.

Sprinthall, R. A. Psychology for secondary schools: the saber-tooth curriculum revisited? American Psychologist, 1980, 35, 4, p. 336-347.

Stevenson, E. A. A study of the education achievement of deaf children of deaf parents, California News, 1964, 80, 143.

Stokoe, W. *Sign language structure: an outline of the visual communication systems of the American deaf.* Buffalo: University of Buffalo, 1945.

Stuckless, E. and Birch, J. The influence of early manual communication on the linguistic development of deaf children. *American Annals of the Deaf*, 1966, *111*, p. 452-460.

Thrower, J. Effects of orphanage and foster care on development of moral judgement. Doctoral dissertation, Harvard University, 1971.

Vernon, M. Relation of language t[illegible]ing process. *Archives of Genetic Psychiatry*, 1967, *16*, p. [illegible]3.

Vernon, M. and Koh, S. D. Early manual communication and deaf children achievement. *American Annals of the Deaf*, *115*, 1970, p. 527-536.

Vygotsky, L. S. *Thought and language*, Cambridge: MIT Press, 1962.

Vygotsky, L. S. *The making of mind: the development of higher psychological processes*. Cambridge: Harvard University PRess, 1977.

Locus of Control:
Review and Implications for Instruction
# of the Hearing-Impaired

Fred J. Dowaliby

and

JoAnne Pegano

Background and Introduction

Locus of control (LOC) first emerged as a psychological construct within the context of social learning theory in the early 1960's. Since then, a vast number of empirical studies, position papers, and literature reviews have been performed. As a result, a great deal is known about LOC.

Julian B. Rotter and colleagues originally formulated the psychological construct and related theory which states that self-perceived locus of control distributes such that two distinctly different types of persons may be identified. "Internals' are those who ascribe the consequences of their activities to their own behaviors and hence assume responsibility for them. Their perceived locus of control is thus internal in the sense that they believe there is a causal relationship between their own behaviors and associated consequences. It follows that internals believe that they can change (or control) their rewards and punishments by appropriately changing their own behaviors.

"Externals," on the other hand, ascribe the consequences of their behavior to forces outside of themselves, i.e., beyond their influence. Fate, luck, and powerful others are examples of such outside forces which represent external loci of control. Individuals holding such a view of the world are not aware of or do not recognize the causal link between their behaviors and the consequences thereof.

While the research is suggestive, unfortunately the relevance of LOC to the instruction of the hearing-impaired is only now beginning to receive attention. The authors are confident, however, in the generalizability of the findings derived from studies using normally hearing subjects to NTID and other hearing-impaired student populations. But, arguments to this effect will have to be supported by empirical evidence beyond that provided by the studies reported herein.

This review was motivated by the results of a survey of NTID faculty which suggested, among other things, that faculty perceive their students as being relatively externally oriented in comparison with other student populations. The implication was that this relatively external orientation is at least partially responsible for some of the unique difficulties of hearing-impaired students. Should this suspicion be confirmed by the research literature and by our own investigation, we shall be on the road to devising more productive ways of managing our students' experiences here at NTID.

Procedures and Organization

Two computer searches were performed yielding a bibliography of the most recently published 125 titles and abstracts relevant to our purpose. Of these, approximately 60 were procured and read in detail. Reiterative examinations of these and other studies and cited references resulted in the final reading of approximately 180 primary and secondary publications. Fifty eight of these are explicitly cited in detail in this review.

Clearly, this review is not intended as a comprehensive discussion of the area. Rather, articles were scrutinized and selected on the basis of our perception that they pertained most directly to instruction of the hearing-impaired.

The studies included in this paper are organized according to a seven-category system which was developed and refined as reading and analysis progressed. The first two categories, "Dimensionality" and "Correlates," are positioned at the start of the paper so as to provide the reader with the conceptual background necessary to understanding specific research questions. Studies addressing specific research questions are organized under the following categories: "Instruction," "Deafness," "Disabilities," and "Changeability." Prior to the final section dealing with the implications of LOC research for our own work at NTID is a section in which we discuss the contributions of attribution theory to a more elaborate and refined conceptualization of the construct.

Review of Studies

Dimensionality

Most of the studies which have focused on the dimensionality of the LOC construct have factor analyzed some version of the Rotter Scale (Rotter, 1966). The model for all of these studies is an investigation reported by Mirels (1970) who factor analyzed the 23 Rotter Scale items administered to over 300 college students. This analysis yielded two orthogonal factors, and these were the same for males and females. The first factor stressed "importance of ability and hard work," and the second, while equally reflective of personal responsibility, was interpreted as a measure of belief in personal "political efficacy." This separation of control over personal events and control over public events was deemed an advance in clarity.

Two replications of Mirels' factor analysis were reported by Viney (1974). In these studies, Australian students were used and, despite slightly different labels for the two factors, similar factor patterns were discovered. Factor I in these studies was labeled "personal responsibility" and Factor II was conceptualized as "social responsibility." Obviously, these labels conform to the Mirels distinction between "ability and hard work" and "political efficacy" in that these factors suggest a boundary between public and private control.

Abrahamson, Schludermann and Schludermann (1973) provided another replication of Mirels' findings. This study was executed on a Canadian sample and revealed still a third factor, "control over one's likeability," which seems to represent an intermediate stage between public and private events.

Joe and Jahn (1973) hypothesized the restricted range of responses produced by the original forced-choice format of the Rotter Scale yielded an artifactual conclusion of unidimensionality. As an alternative, these researchers devised a Likert-type version of the scale and administered it to 288 psychology students. Consistent with Mirels' findings, the personal and political factors were revealed, and there was no difference between males and females. As was the case in the Australian study, the labels here were also reconceptualized so that factor I become "primary determinants of success" and factor II "political efficacy". We may conclude that these are essentially the same factors as those adduced by Mirels, Viney, and Abrahamson, et al.

Kearney and Kearney (1977) also factor analyzed the Rotter Scale. Their analysis was consistent with the Rotter assumptions of "luck" and "powerful others" as salient categories. However, among the female members of the sample, "powerful others" was discovered to comprise three subconcepts: 1) ability to influence political persons and events; 2) ability to become a powerful other; and 3) ability to deal with criticism when tendered by authority figures. Once again, we see a distinction between personal and public control.

Three factors also emerged in analyses performed by Kleiber, Veldman, and Menacker (1973). In a procedure similar to that employed by Joe and Jahn the 23 forced-choice items of the Rotter Scale were converted to 46 4-point Likert-type items. These items were randomly reordered and interspersed with 40 filler items. Once again three factors emerged: 1) luck and chance; 2) externality; and 3) internality.

Using another Likert-type conversion of the Rotter Scale, Collins (1974) identified four factors. These four factors were defined in terms of dominant world perception and reflected 1) difficulty vs. ease; 2) justice vs. injustice; 3) predictability vs. unpredictability; and 4) political responsiveness vs. unresponsiveness.

The personal and political control dichotomies found by these studies were employed by Ramaniah, Ribich and Schmeck (1975) to compare internals and externals with respect to performance on the Survey of Study Habits and Attitudes (Brown and Holtzmann, 1967).

When the dimension of interest was the personal control scale, internals were found to have more effective study habits; however, when the political control scale was scrutinized, there appeared to be no difference between externals and internals. This anomaly supports the hypothesis of multidimensionality since, if LOC did reflect a single bipolar characteristic, we should expect this internal-external difference to appear across scales. It seems clear that the more fruitful speculation is that LOC probably reflects a constellation of reasonably independent dispositions and attitudes.

The most compelling conclusion suggested by dimensionality research is that LOC dimensions are situation or domain-specific and that certain situational demands may elicit responses peculiar to that situation. However, before we conclude that the next step is to attempt to map a typology of situations according to their internal-external position, we should note some limitations of the investigative techniques used. All of these studies employed some form of the Rotter 23-item scale. The resulting observed factors, therefore, will necessarily be limited to the content expressed by those items. Given that fact, it is not surprising that five of the studies surveyed reported a "powerful others" factor since this factor is implicit in certain items. The difficulty lies in the possibility that no items tap other equally important dimensions. This constraining nature of the techniques employed when viewed jointly with the subjective nature of factor selection and interpretation recommends a conservative summative approach.

The common finding among all of the reported studies is that whatever labelling and other methodological and conceptual devices were employed, individuals were noted to be characterizable according to whether their orientation to causal explanation tends toward the taking of personal responsibility or to the displacement of responsibility on to one or more external causes.

The situational character of LOC alluded to will be discussed in the section on attribution theory. First, however, we will examine particular applications of the construct vis-a-vis the interaction of LOC with other cognitive and affective characteristics under specified instructional and task conditions.

Correlates

Studies which report relationships between other measures and LOC are included under this heading. This summary will not include such commonly reported pervasive effects as sex (males more internal than females) and age (LOC shifts toward internality with increased age). We will discuss only those psychological and performance correlates directly related to various aspects of instruction.

Among dispositional characteristics investigated, "trait anxiety" has been shown to be consistently related to LOC. Lichtenstein and Keutzer (1967), for example, administered Rotter's I-E Scale and the IPAT Anxiety Scale to a large group of adults in the course of a smoking control research program.. A simple correlation of .41 between the I-E and IPAT Scales was observed, indicating externals to be more prone than internals to debilitating anxious reactions to situations.

Hountras and Scharf (1970) reported consistent findings. Sixty low-achieving freshman males were administered Rotter's I-E Scale and the Taylor Manifest Anxiety Scale. Again, results suggested that externals were higher than internals in trait anxiety.

This same relationship has been demonstrated in the case of state anxiety by Weiner and Potepan (1970), who found that successful students were relatively internal and had low test anxiety.

Certain cognitive dispositions and abilities have also been demonstrated to be related to LOC. Two studies examined the relationship between LOC and field-dependence. Lefcourt and Telegdi (1971) employed the rod-and-frame measure of field-dependence and the Rotter I-E Scale as independent variables. Significant interactions were obtained on two measures of verbal productivity and two measures of cognitive activity. As was expected, internal field-independent subjects scored highest on all measures. The converse expectation, that external, field-dependent subjects would score lowest of all, was not supported. Rather, the theoretically incongruent groups (external/field-independent and internal/field-dependent) scored lowest on each measure of "cognitive activity." This finding is reminiscent of the aptitude-by-treatment interaction (ATI)[1] studies reported in the section on instruction and indicates the complex nature of LOC.

Chance and Goldstein (1971) tested male and female subjects with a series of 68 embedded figures. Short disembedding time on this test indicates field-independence, and longer discovery times indicate field-dependence. Results indicated that while all subjects improved with practice, internals' disembedding times decreased the most, suggesting that internals will have an easier time mastering tasks that require a field-independent style.

Another set of studies focused on "mental or verbal ability." Powell and Centa (1972) investigated the hypothesis that internal LOC is associated with greater mental ability. Twenty-three undergraduates were administered Rotter's I-E Scale, the Henman-Nelson Tests of Mental Ability (College Level), and the Adult Locus of Control (ALOC) Scales. Results were intepreted as suggesting significant although modest relationships between each of the LOC scales (which intercorrelated at -.51) and the Mental Ability Scale.

---

[1] An ATI exists whenever the relationship between one or more aptitude and one or more instructional outcome varies with different methods of instruction (see Berliner and Cahen, 1973).

Brecher and Denmark (1969) reported similar conclusions. Eighty-four female subjects were administered Rotter's I-E Scale and Thurstone's word fluency test. As expected, mean fluency scores of internals were significantly higher.

In a related study, Penk (1969) reported findings which demonstrate such a relationship between level of verbal abstraction and degree of internality. Bialer's I-E Scale and nine experimental tasks, including inkblots, word association, object sorting, category width preference, etc. were administered to small groups of children. Results indicated that internals were higher on vocabulary, object sorting, McGaughran's open-public sortings, and Rappaport's functional sortings. In addition, internals showed quicker reaction time for word associates and a facility for Moran's object-referent word associates.

Finally, a set of findings have been reported which suggest a relationship with mental efficiency. Gozali, Cleary, and Gozali (1973) hypothesized that internals use specific identifiable test-taking strategies which result in higher achievement. A large group of university students were administered Rotter's I-E Scale and a verbal ability test constructed from ETS' item pool, with test items ordered for difficulty. This verbal ability test was administered and recorded by computer, allowing the use of response latency or "time on item" as a dependent measure. As expected, internals but not externals used time in a way systematically related to item difficulty.

Prociuk and Breen (1974) reported consistent findings. College students were administered the Levenson Internal, Powerful Others, and Chance Scales and the Brown-Holtzmann Survey of Study Habits and Attitudes. The two external scales, the Powerful Others and the Chance Scales, were both related to ineffective study habits and attitudes.

Another study, DuCette, Wolk, and Friedman (1972), hypothesized that internals are more active and efficient in both using information and in creativity. The IAR and the

Pattern Meanings Test were administered to 40 lower-class males. Consistent with findings of other studies, results indicated greater creativity and creative efficiency for internals.

The studies reviewed have yielded theoretically consistent findings. It has been shown that externals are more likely to have debilitating anxiety reactions, be field-dependent, be lower in mental ability, verbal ability, and efficiency, and have less effective study habits and attitudes while internals tend to relatively excel in all of these areas.

We will turn now to studies which have shown how LOC, either singly or in interaction with other characteristics , acts as a determinant of performance quality in various contexts and under a variety of task and instructional conditions.

Instruction

The relationship between LOC and various instructional outcomes has been examined in several studies. There is clear evidence that LOC is an important instructionally-relevant variable which operates differently within various social, psychological, and environmental contexts.

Shaw and Uhl (1971) studied possible relationships between children's LOC and reading scores for lower and upper-middle socio-economic status (SES) white and black groups. Locus of Control related to reading ability only among white upper-middle SES children. In other words, only among this group was it the case that externals were poorer readers than internals. The authors speculated that a possible reason for this finding was that different operative values for reading across SES groups may have produced differential expectations for reading success. It has been demonstrated in a number of instructional areas that expectation for success does exert a strong influence on successful achievement, and so it may be that this relationship is responsible for the qualified relationship between LOC and reading ability noted by Shaw and Uhl. When we come to our discussion of attribution theory, we will show how expectation of success relates to the notions of internality and externality in a reciprocally causal manner.

Messer (1972) investigated LOC and general academic achievement among children. School grades and tests of academic achievement were compared with LOC in this study. It was found that internals had higher grades and achievement test scores. This relationship held even when IQ and cognitive impulsivity were controlled. Such a finding demonstrates that LOC is not related to either impulsivity or IQ and is consistent with the Shaw and Uhl (1971) qualification regarding the predictive validity of LOC. This finding also indicates that LOC is an independent determinant of achievement.

Nord, Connelly, and Daignault (1974) performed a similar investigation with entering MBA students. An admissions test for graduate study in business and Rotter's I-E Scale were administered, and data on course grades, LOC and the admissions test were collected. Results were interpreted as demonstrating that the admissions exam was unrelated to LOC. However, both LOC and performance on the admissions exam were related to course performance. Moreover, the results showed differential predictive utility of these measures, depending on the course. This observed difference allows an inference of the presence of latent aptitude-treatment interactions (ATIs).[1] And, in fact, several studies have been reported which have investigated ATIs involving LOC.

Arlin (1975) studied the interactive effect of task and class structure and LOC on pupil attitudes. On a student attitude questionnaire, internals tended to favor open, low-structure teaching environments and when provided with such an environment, expressed more positive attitudes to the instructional experience. When the instructional experience occurred within a traditionally structured environment, there was no difference between internals and externals.

Parent, Forward, Canter and Mohling (1975) reported similar findings. College students were administered Rotter's I-E Scale, then engaged in a 2-hour minicourse on computer programming taught in one of two ways. The condition defined as "high discipline" provided a great deal of external structure, while the "low discipline" condition allowed self-pacing and imposed no rules. The differential effects of these two conditions between LOC groups were as expected: internals performed better under the low discipline condition, and externals demonstrated greater achievement under high teacher discipline conditions.

Another similar study is reported by Rich and Bush (1978). College students were classified as internals or externals according to Rotter's I-E Scale. Students evaluated high and low faculty-control instructional styles by completing a questionnaire following each class session. High control was defined in terms of lecturing, directing, or providing information, and low control in terms of student verbal or physical participation, either independently or student-to-student. As the authors hypothesized, students in instructional conditions congruent with their own LOC style (i.e., external students/high control and internal students/low control) made more positive evaluations than students in situations judged incongruent with their own styles (external students/low control and internal students/high control).

Finally, conclusions reached by Allen, Giat, and Cherney (1974) lend additional support to the congruence position. Subjects were 51 females and 37 males in a college PSI (personalized system of instruction) course. The format allowed students to control pacing and selection of areas of instructional materials. LOC and trait anxiety were assessed during the first class, and state anxiety immediately before oral exams. From the results, the researchers concluded that internal LOC students learned more efficiently, were less anxious during oral assessments, and performed higher on a written final exam than external counterparts.

The studies reviewed point directly to the relevance of the LOC construct to instruction. Three focused on the predictability of academic achievement from LOC. Reliable relationships were indicated by all three, with internals consistently outperforming externals. The ATI studies extend this basic finding to demonstrate that congruence of the learner's LOC and certain structural aspects of the instructional situation are important. For example, it was found that internals rated most highly and learned more in instructional situations which were low in either structure, discipline, or faculty control. Similarly, externals, who prefer a great deal of structure, maximize their performance potentialities in highly structured and controlled environments.

The studies which we have examined so far dealt with relatively homogeneous mainstream populations. But LOC has also been found to be a salient explanatory construct for the achievement related behaviors of special student populations as the following studies demonstrate.

Deafness

Studies relating deafness to LOC primarily demonstrate that the relatively impoverished linguistic experience of deaf students is directly connected both to a demonstrated external orientation and to perceived performance deficits. Three studies are reviewed which pertain directly to deafness and LOC.

Bodner (1976) assessed LOC among 228 deaf students, categorized as either "young" or "adult." It was previously noted that behavioral correlates of externality in a hearing sample approximated the life conditions of the linguistically-isolated deaf who are, in fact as well as in belief, dependent on the external world. The mean ages for the young and adult groups, respectively, were 11.4 and 20.3, with 84 classified as "young" and 144 as "adults." A total communication version of the Bialer-Cromwell Children's Locus of Control Scale was administered via videotape. Preliminary psychometric analyses resulted in the conclusion that the instrument had unacceptable validity for the young group and low reliability for the adult group. However, reliability for adults in the upper 25% of the reading level distribution was sufficiently high to allow comparison of the deaf subjects to hearing norms. The preliminary conclusion was that the high-reading deaf students were significantly more externally oriented than hearing norms. Given what we know about relative performances of internals and externals in instructional situations, the implications for the education of the hearing-impaired are clear.

The above finding was supported by Blanton and Nunnally in a set of two studies which employed two different measuring instruments (Blanton & Nunnally, 1964). The first used the Bialer-Cromwell Children's Locus of Control Scale and found that deaf children attributed, to a significantly greater degree than hearing controls, the responsibility for events to external rather than personal or internal causes. The second study employed the Locus of Evaluation Scale in addition to the Bialer-Cromwell Scale and reported consistent findings. The interesting assumption underlying the second study was that hearing-impairment results in relatively little experience with evaluational and affective words. The smaller affective vocabulary of deaf students is presumed to be directly connected to relative immaturity in social-emotional growth, since it is hypothesized that social growth is highly dependent on the use of judgemental affective categories. Therefore, deaf students' dependence on others for the evaluation of performance results in greater externality.

Disabilities

The following five studies relate the general concept of disability to LOC. A variety of physical as well as cognitive disabilities were found to correlate significantly with externality. In comparison with normal controls, disabled groups tend to exhibit a significantly greater degree of external orientation.

Hallahan, Gajar, Cohen and Tarver (1978) employed both the Intellectual Achievement Responsibility Questionnaire (IAR), an academic-specific measure of LOC and the Nowicki-Strickland Scale, a global measure of the same construct. Twenty-eight learning disabled (LD) and 28 normal (matched) teenagers were administered these instruments. LD subjects were significantly more external than the controls, although no relationship was found between the two measures. The multivariate aspect of this finding suggests that the effect of disability on control orientation is even more pervasive than previously suspected.

A second study which also examined the relationship between LOC and learning disabilities is reported by Chapman and Boersma (1979). These investigators also used the IAR. The IAR is believed by some to be an improvement over other scales because it yields two subscores - one for each of positive and negative events. Results indicated that LD subjects were relatively external regarding positive events. However, no difference was observed for negative events. An additional finding, and one that may offer an explanation of the discrepancy, is that LD mothers had more negative and fewer positive reactions to their children, leading perhaps to the child's belief that, if he is successful, it must be because of chance, etc. Similarly, if interaction with the mother tends to produce a sense of intrinsic inferiority in the child, he will likely assume that all failure is attributable to his own deficiency.

In the area of physical disability, Land and Vineberg (1965) compared blind children with sighted controls on LOC. Residential and nonresidential blind children were examined. The Bialer-Cromwell Scale was employed, and groups were equalized for mental age. Results indicated that blind subjects were more externally-oriented than sighted controls. No difference was found, however, between residential and nonresidential blind subjects.

MacDonald and Hall (1971) investigated attitudes toward various types of disabilities and LOC for a large group of undergraduate students (211 male and 268 female). Disabilities included: 1) internal; 2) sensory; 3) cosmetic; and 4) emotional. The Rotter Scale was employed and results indicated an interaction between LOC and type of disability in terms of ratings of self-impact. Consistent with expectations, externals rated physical disabilities as more debilitating than internals. In contrast, internals rated emotional disorders as being more debilitating relative to physical disabilities.

Finally, Lipp, Kolstoe, and James (1968) investigated physically disabled vs. normal subjects' denials of perceived disabilities as a function of LOC. A major finding was that physically disabled subjects demonstrated extreme difficulty in perceiving slides of disabled persons when contrasted with viewing slides of normal persons. They, in effect, blocked perception of other disabled persons. This result was interpreted as a denial of disability, consistent with findings from other studies. Contrary to the investigators' expectations, external disabled subjects were less denying of their disabilities than internals. This phenomenon was explained in terms of externals' being accustomed to less perceived control and therefore less threatened by the loss of control implied by physical disability.

All of the research we have examined thus far gives us reason to believe that LOC is responsive to a variety of situational features of the instructional process. This being so, we are led to the speculation that LOC may be manipulable in consequence of changes in these features, and, in fact, research suggests that such change is possible.

Changeability

A number of studies have yielded findings which indicate that certain experiences and/or environmental conditions can produce changes in LOC. These findings are consistent with LOC Theory. Foulds (1971) hypothesized that a growth group experience of 8 weekly 4 1/2 hour sessions would increase participants' internality. The sessions were explicitly intended to provide an environment in which acceptance of personal responsibility was encouraged. Thirty undergraduates volunteered to participate in this experimental group while controls were selected from a psychology course. All subjects were administered Rotter's I-E Scale pre and post, although only the experimental group participated in the sessions. The sessions encouraged risk and openness, and "straight talk" was urged. The sensory awareness, nonverbal and psychodrama exercises which made up the largest part of the group experience were performed in a supportive environment. As expected, the experimental group evidenced a significant shift toward internality. No change in LOC was indicated for the control group. This finding must be cautiously interpreted, however, in view of the fact that the experimental subjects were volunteers while the controls were selected. The fact that the experimental subjects had volunteered means that this group already desired change, and the desire for change is a necessary condition of its occurence.

In another study, Nowicki and Barnes (1973) demonstrated that LOC changes may result from a structured camp experience. The Nowicki-Strickland Scale for Children was administered, pre and post. During the week intervening between these administrations inner-city teenagers participated in a structured camp experience. Significant shifts toward internality were observed. Once again, this finding is consistent with other results although the authors note the lack of proper controls.

Several studies have investigated changes in LOC as a function of induced success and/or failure. The underlying assumption in these studies is that since control orientation is closely linked to performance expectancy, manipulation of success and failure perceptions should result in a shift in orientation.

Problem-solving styles have been characterized along an inner-outer continuum analogous to control orientation. Outer directed problem-solving style is defined in terms of reliance on concrete situational cues, whereas inner directedness is characterized by attempts to deduce abstract relations. It has been demonstrated that manipulating success and failure in problem-solving situations as well as manipulating task cues so that tasks will be perceived by subjects as requiring either internal or external strategies results in a shift in control orientation.

MacMillan and Wright (1974) reported findings which indicate that children's problem-solving styles change on the LOC dimension when the experimental task is preceded by a similar task on which the child performed either successfully or unsuccessfully. Second, fourth, and sixth graders were randomly assigned to success or failure problem-solving conditions, followed by a similar problem-solving task. It was assumed that outer directedness could be inferred from task performance. Greater externally-oriented behavior and perceptions (as adduced from self-report) were observed following failure conditions.

Consistent with this finding, Gorman (1968) reported that 62 undergraduate McCarthy supporters scored extremely high on externality directly following the failure at the 1968 Democratic Convention. Because there are no controls other interpretations may be possible, and caution must be exercised. This finding, however, is consistent with MacMillan and Wright (1974) in terms of the effect of induced failure.

Brecher and Denmark (1972) also reported consistent findings. Of 88 undergraduates who were administered the Rotter I-E scale, 66 were used as controls, and the remaining

22 were assigned to the experimental condition. The experimental condition consisted of strong negative feedback to students concerning their performance on a previously (three weeks) administered exam immediately before they completed the I-E scale. The instructor reported to this group that the exams were the worst she had ever seen, that she would not be returning them, and that more than one half of the class had failed with the rest doing poorly. The results indicated significantly greater externality for the experimental group. Once again, perceptions of failure evidently exercised a strong influence on control orientation. Furthermore, the introduction of failure apparently can be sufficient to provide a shift toward externality. Likewise, we should expect that success will be related to a shift in the internal direction.

Two aspects of the findings on induced success/failure are particularly intriguing and suggestive. In the first place, the variables manipulated are unequivocal and easily replicable. Secondly, these findings suggest that an individual's LOC is quite malleable, with relevant precipitative experiences having a predictable effect.

Several studies have examined the effect of salience of structured features in the learning situation which would be expected to produce belief in the availability of internal control. Eisenman (1972) examined the effect of experimental instructions on LOC. College students participated in three verbal conditioning studies wherein they had to guess with which pronoun another student had begun each of 30 sentences. Fifty subjects were told that their "clinical sensitivity" could lead to excellent guesses. Fifty other subjects were told that the correctness of their choices would be purely chance, and that the distribution of their random guesses was under study. A third group of fifty subjects served as controls. All were administered the Rotter I-E Scale, both pre and post. As hypothesized, changes in subjects' LOC occurred in directions congruent with the experimental instructions. The internal (i.e., "clinical sensitivity") instructions increased internality, while external (i.e., "random") instructions increased externality. No shift was indicated for control subjects.

Pedhazur and Wheeler (1971) reported consistent results. Fifty-three minority children identified as externals read a story which made perceived internal control more salient. Post administration of the Bialer Scale for LOC indicated an increase in internality. While proper controls were lacking and subjects were minority children and hence not representative, the results are nonetheless consistent with other findings.

Johnson and Croft (1975) also revealed similar findings. The relationship between LOC and performance in a personalized system of instruction (PSI) course was the primary focus here. LOC was assessed by Rotter's I-E Scale both pre and post for 179 college students enrolled in a personality course. Standard PSI features were present, such as individual contracting and pacing, explicit structure, and explicitly formulated criteria. Although LOC was not related to course performance, significant change toward internality was observed. The PSI features probably increased the salience of the availability of internal control in a fashion similar to that in the previously discussed studies.

Taken as a set, these studies suggest essentially three conditions which give rise to predictable changes in LOC. The Foulds (1971) study suggests the need for a non-threatening, supportive environment. The findings from the induced success/failure studies are fascinating in their simplicity and adherence to basic principles of learning. It was shown that subjects who experience only failure become more external in their LOC. This makes sense in that each instance of failure can be seen as an extinction trial. The individual's belief in the availability of success and his consequent effort seem to systematically decrease over trials. Conversely, it was shown that internality may be increased by the induction of success. This finding has been interpreted as revealing an opposite side to the failure effect. That is, each instance of success seems to act like a reinforcement trial, with systematic increments in the individual's belief in internal control appearing over trials. The third condition necessary for change seems to be knowledge of and belief in the availability of internal control. Otherwise stated, subjects must be aware of and believe in the causal relationship between their behaviors and results. Such awareness has been shown to be manipulable by changing environmental cues in such a way that demands for internality become salient.

Simply instructing subjects in these matters would probably not produce shifts, however. The preceding findings do suggest, nevertheless, that specific experiences of short duration can produce predictable shifts in control orientation in either direction along the LOC continuum.

Further study in the changeability of LOC orientation given the demonstrated relationship between achievement performance and LOC is of special interest for instructional research. Such future study will benefit the theoretical elaboration and refinement of the LOC construct as provided by attribution theory.

Amendments and Contributions of Attribution Theory

While the internal-external dichotomy affords a foundation for explaining performance differences in terms of the individual's perception of the dynamics of control, it has been argued to be inadequate as a total account of these differences. In fact, with respect to such phenomena as shifts in expectancy of success following positive affective experiences, the social learning theory construct of locus of control makes predictions in the opposite direction from those that have been substantiated by research grounded in attribution theory. Basically, the reconceptualization of the control construct offered by attribution theory is intended to account for those transient affective experiences, which though transient, nevertheless influence the control orientations of individuals as they respond to the immediate demands of variously structured situations. Where locus of control as formalized by Rotter refers to a relatively stable dispositional characteristic of individuals, attribution theory suggests 1) that situational features account at least in part for these apparent dispositions, and 2) that contextual variations can account for some of the predictive failures of social learning theory.

In educational research, Bernard Weiner's work has been most influential in recasting the control construct in terms of responsibility attribution. Rather than there being a single question regarding the person's disposition to locate causes either internally or externally, two questions are raised: 1) Is control located internally or externally, and 2) Is the causal explanation provided grounded in stable conditions of either person or environment or is it grounded in some more ephemeral condition of person or environment? Questions for research probe the relationship of these attributions to general motivational and other affectual predispositions and to the effect of contextual manipulations. Weiner argues that reconceptualization of the control construct in line with these kinds of questions can yield a total theory of motivation which will enable us to explain classroom success and failure. By providing such a motivational explanation, he also asserts that it is possible to derive concrete recommendations for classroom practice.

In the process of reconceptualizing the construct, Weiner (1979) argues that "locus of control" is not a single construct. Rather it is to be measured along three axes or dimensions. Causal attributions occur always along these three dimensions, so that causality 1) may be either internal or external to the individual, 2) may be attributed either to stable or to changing conditions (a causal explanation at the unstable end of this axis is not an explanation that will be invoked in dissimilar situations), and 3) a person's intentions may or may not be perceived to affect consequences.

Weiner argues that each of the three dimensions has a primary psychological connection: stability is connected to and predictive of the magnitude of expectancy of success following success - if a person accustomed to failure achieves success in some situation and attributes it to luck, there is little likelihood that his expectations for future success will be raised; internality is posited to be linked to self-esteem. Since self-esteem is necessary to the preservation of the person's integrity, attribution to external causes is sometimes necessary in the interest of survival; perceived controllability is directly linked to task evaluation. In concrete terms, a success attribution to the internal and stable factor of ability yields feelings of competence which necessarily lead to expectancy of success, positive evaluation of the task and perceptions of control.

The model which Weiner proposes is in terms of a cognition-emotion sequence:

1) An immediate emotional response is generated by an outcome in an achievement situation.
2) This outcome is attributed to some cause.
3) This causal information is processed to form a relatively stable self-perception and a stable set of expectancies.
4) Expectancies for future performance act on performance in future achievement situations.

Weiner concludes that manipulation of classroom settings by providing different emotional experiences can mediate changes in these causal perceptions since the chain is begun with an emotional response.

A series of studies exploring the relationship between causal ascription and affect (Weiner et al. 1972) demonstrated that stable, internal ascriptions increase the tendency for self-reward and self-punishment and that the converse is true of ascriptions to unstable, external factors. In this series of studies it was further demonstrated that expectancy of success is mediated primarily by the stability of ascription, i.e. expectancy of success is not likely to change immediately for a person who attributes failure to his own relatively stable lack of ability. Concomitantly, ascription of success to internal, stable, and controllable causes (effort) leads to greater self-reward and greater expectancy of success. An interesting conclusion from these studies is that task difficulty (an external and uncontrollable cause) appears to be a salient cue mediating the tendency to expend effort and thereby risk the loss of self-esteem. Tasks of intermediate difficulty seem to elicit the greatest effort expenditure. When this expenditure meets with success, expectancy for future success increases, and immediate effort becomes typical effort.

Clearly the desirable state of affairs would be for persons in achievement situations to ascribe responsibility to their own typical effort and ability. It seems that the way to accomplish this would be to provide students with moderately difficult tasks, or tasks which they can perceive as moderately difficult and to structure the situation so that the outcome will be successful. In terms of the cognition-emotion sequence, this success will elicit a positive emotional response. That response will be attributed to some cause. Now, if a reasonable amount of effort has been expended, that perceived cause will be the effort. That in turn will lead to a perceived connection between the positive emotional state associated with success and effort expenditure, which leads to the prediction of future success given the expenditure of effort, and finally will lead to the actual expenditure of effort which is at least a necessary condition of actual success in fairly structured achievement situations.

As noted at the start of this section, Weiner, Nierenberg, and Goldstein (1976) have argued that social learning theory and attribution theory make contrasting predictions regarding expectancy of success in general. Success experiences were manipulated in a study involving 126 male undergraduates. It was demonstrated that expectancy of success is related to stability of perceived control but that perceptions of control are not significantly related to either expectancy of success or to numbers of prior successes. What this means is that a person may have a stable attribution of control to task ease, and this will not increase his expectation of future success since we can not always count on tasks to be easy. Nor will a large number of successes which are attributed to external causes increase expectancy of success. However, if one thinks that success and failure are under self control and that this control derives from stable features of self action, then success will be expected in future situations. Success alone is not a sufficient condition to insure expectancy of success although it is a necessary one. The necessary and sufficient conditions for the promotion of expectancies of success are past success combined with attribution to stable, internal, and controllable causes.

A number of studies have investigated the relationship between attribution of causal responsibility to stable, internal, controllable causes, and other characteristics of the person.

Diener and Dweck (1976) provide evidence that response to failure and responsibility attribution differs for helpless children and mastery-oriented children. While mastery-oriented children engage in self-instruction and formulation of remedial strategies, helpless children verbalize that failure is caused by their own lack of ability. They make uncontrollable, stable, internal attributions. Mastery-oriented children, on the other hand, believe in the efficacy of their own effort and thus formulate alternative responses.

A study by Crandall, Katkovsky, and Preston (1962) revealed a high correlation between valuing achievement and internal, stable responsibility attribution. The most important finding in this study was that responsibility attribution is an excellent predictor of achievement behaviors. If, as Weiner claims, it is possible to manipulate responsibility attributions by changing classroom settings to provide positive emotional responses linked to responsibility, then by implication, it is possible to promote appropriate achievement behaviors.

Ames and Lau (1979) investigated the relationship between student ratings of a course and attribution perceptions and discovered that internality was related to positive course evaluations independently of grade received, while the reverse was true for externals. For externally-oriented students, positive evaluation was always accompanied by a high grade. This finding was corroborated by Stebbins and Stone (1977).

Relationships between success and stable internal attributions were found in a study by Arkin and Maruyama (1979). Students were found to make attributions to others' outcomes that were mirrored to self attributions. Successful students attributed others' outcomes to stable and internal causes as often as they did their own. The reverse was true of unsuccessful students.

In general, success more than failure seems to be attributed to internal factors (Lugenbuhl, Crowe and Kahan, 1975). An interesting study by Simon and Feather (1973) demonstrates that this tendency represents a weighted combination of properties of the person and properties of the task. Simon and Feather discovered that variable and external factors are most likely to be invoked as causes when outcomes violate expectations. Thus, a student who believes himself prepared for an examination and who expends a considerable amount of effort in writing, and yet fails, is likely to attribute his/her failure to an external variable cause such as luck. This could explain the findings reported above, especially when viewed in light of Weiner's suggestion that different settings might provide opportunity for differential attribution formation.

Ames, Ames, and Felker (1977) found that both the affect-laden experience of self-evaluation and the attribution of responsibility for success and failure are highly dependent on whether the reward structure is based on a competitive or a noncompetitive situation. Differential effects on both self and other judgments were found. In this study, pairs of fifth grade boys solved achievement puzzles in either a cooperative or competitive situation. In the competitive situation, failure was self-punished, strong negative affect was present, and failure subjects felt themselves to be less competent than their partners. Once again, the theoretical framework of attribution theory is confirmed since affect is associated with self-esteem. A primary outcome of this sort of negative experience will be attribution of cause to lack of ability. With repeated occurrences, this will become a stable self-perception, and will lead to depressed expectancy of success, and a decrement in achievement behaviors.

One final study dealing with the effect of situational structure on responsibility attribution was carried out by Phares and Wilson (1972). They found that generalized causal expectancies operate with greater force in situations where the cues are ambiguous. In highly structured situations it was found that the provision of explicit cues depresses individual response tendencies. Where the cues for the appropriate placing of responsibility are ambiguous, however, subjects revert to generalized dispositions.

This approach to the problem of responsibility and motivation appears to be potentially fruitful for classroom purposes. There is hope that if the environment is manipulated in ways that associate positive affective experiences with achievement situations, and if the reward system is structured to capitalize on students' controllable skills and abilities, we should see an increase in the self-esteem and expectancy of competence requisite to actual success.

Summary and Implications

This final section will be restricted to a discussion of the implications of the control construct, particularly as reformulated by attribution theorists, for research and practice in the teaching of hearing-impaired students. We can conclude from our search of the literature that the experienced-based intuitions of NTID faculty are corroborated. Hearing-impaired students do exhibit a relatively greater tendency toward externality, and externality is related to poorer achievement and less effective study habits and attitudes. While conclusions specifically regarding hearing-impaired populations must be qualified in view of the small number of reported studies, it is suggestive that no studies report results contradictory to the conclusion that such students are more likely to exhibit an external orientation. Moreover, despite the limited number of studies relating hearing-impairment to control orientation, there exists a relatively large number of studies that grouped under the rubric of "special populations." The consistency of findings, despite variations of impairments, adds force to the arguments concerning hearing-impaired students.

We can easily understand the reason for this hypothesized greater externality of hearing-impaired students particularly when we take account of the situational contingency of control orientation proposed by attribution theory. In fact, as well as in belief, deaf persons are more dependent on the external world and on powerful others than is a normally hearing person. Not only is such dependency a consequence of the physical handicap itself, it is also promoted by the typical forms of social interaction. Handicapped persons are rewarded for behaviors that would be defined as overly-dependent in a physically normal person. And the hearing-impaired have a special problem even when compared with other handicapped and otherwise disadvantaged populations. Their isolation from the dominant communicative mode in human communities leaves them more dependent on others for evaluation and judgment of their actions. The one study we discovered dealing with the "locus of evaluation" and its relationship to the range of affective vocabulary encourages us to think that the manipulation of control orientation without attention to situational and affective factors will yield only equivocal results.

We take as our starting point the formulation of LOC given in social learning theory as a relatively stable disposition of persons to regard control over outcomes to either internal or external causes. We conceive of this predisposition as a prime determinant of achievement outcomes. However, the studies within the context of attribution theory and even some studies within the original paradigm lead us to believe that situational and affective characteristics fully cross with and moderate the relatively stable control predisposition. Taking this point of view, we should be able to devise some feasible strategies for investigating LOC at NTID. Consideration of transient affective and situational factors should be ultimately more productive of change than a focus solely on what has been defined as a relatively stable predisposition.

Preliminary study, then, should focus on the investigation of the distribution of the stable predispositional component of locus of control for NTID students. Such a study should include, but not be limited to, the development of a psychometrically sound instrument for assessing LOC among hearing-impaired students. This would form the basis for comparative study.

The proposed instrument would be different from the Rotter Scale and other traditional instruments since its grounding in attribution theory would entail our characterizing the stable component of LOC as a unidimensional characteristic. The reader will recall that social-learning theory researchers concluded in favor of the multidimensionality of the construct. We suspect that the reason for such a conclusion is that traditional social-learning theory combines the transient and the stable components of control orientation. Since it has been demonstrated that LOC does shift with perception of the demands of environmental cues and transient moods, we propose that the various factors be distinguished in the psychometric instrument. We can speculate that separating transient from stable components under the assumption that these transient components act as moderator variables on the stable predisposition will enable us to investigate the environmental contingencies and affective responses related to fluctuations along the internal-external continuum.

Given this framework, we may formulate some tentative hypotheses regarding NTID students. We may suppose that our psychometric evaluations will support the faculty's hypothesis that NTID students are relatively externally oriented. This orientation we will suppose is pervasive and stable. Simultaneously, we are led to look for features of instructional content and organization that provide cues that provoke external causal perceptions. We would suspect that the stable component will fluctuate with differential perceived demands in the educational situation. Finally, we must suppose that the perception of these cues, that is the degree to which they appear to signal externality or internality, is related to the student's affective response to the situation. This implies that a student high in externality will make more external attributions in a learning situation which is controlled by the teacher, provokes anxiety, and threatens the self-esteem. Conversely, we may expect that this same student, when confronted with cues which demand perception of personal responsibility within a context designed to maximize self-esteem and minimize affective threat, will make (relative to his own predispositional response tendency) fewer external attributions. This, in turn, should provoke greater activity and time on task so as to maximize achievement and a shift toward relative internality.

However, when thinking along the above lines, we must also keep in mind those studies which investigated the instructional relevance of locus of control and demonstrated that congruence between instructional technique and stable personality aspects is critical in achievement. It will not do to simply place an externally-oriented student in an environment which demands personal control. Such a strategy would ultimately prove disastrous because the affective aspect of the interaction between person and environment would be overlooked. Nor will it do simply to match externally-oriented students with learning environments which allow and encourage externality, although such a strategy might initially produce greater achievement effects. What is dictated is an incremental approach where environmental cues demanding internality are gradually introduced within situations that produce positive affect.

Such an approach is consistent with other findings in educational psychology. Aptitude-treatment interactions similarly support a congruence/accomodation model with other nonability measures, such as cognitive style, trait anxiety, and achievement orientation, characteristics which also interact with instructional technique.

In terms of future instructional research, then, one possible direction is an investigation of a series of matching/mismatching studies which would look at such variables in combinatory effect with locus of control. We would expect to find some optimal level of matching which, while producing the requisite positive affect, would also promote change. Multivariate studies of this sort would allow for the testing of other univariate hypotheses as well as provide a ground for testing the conjoint influence of several variables.

Clearly, this approach suggested by attribution theory impacts most forcefully on the issue of changeability of perceived locus of control. Strategies which simply manipulate task outcomes will necessarily yield only equivocal results when pervasive and relatively stable change in perception is desired, since such strategies do not and cannot take account of the demonstrated crucial aspects of learner expectation, perceived effort, and self-integrity. A simple input-output model neglects the actual responsibility students do have for their own learning, and places the entire responsibility on the educator. In the final analysis, if such strategies did produce reported shifts in perception, in reality the learner would be totally dependent on environmental manipulation and the whims of happenstance.

References

Abrahamson, D., Schludermann, S. and Schludermann, E. Replication of dimensions of locus of control. Journal of Consulting and Clinical Psychology, 1973, 41(2), 320.

Allen, G. J., Giat, L. and Cherney, R. J. Locus of control, test anxiety, and student performance in a personalized instruction course. Journal of Educational Psychology, 1974, 66(6), 968-973.

Ames, C., Ames, R., and Felker, D. W. Effects of competitive reward structure and valence of outcome on children's achievement attributions. Journal of Educational Psychology, 1977, 69(1), 1-8.

Ames, R., and Lau, S. An attributional approach to the validity of student ratings of instruction. Contemporary Educational Psychology, 1979, 4, 26-39.

Arkin, R. M. and Maruyama, G. M. Attribution, affect, and college exam performance. Journal of Educational Psychology, 1979, 71 (1), 85-93.

Arlin, M. The interaction of locus of control classroom structure, and pupil satisfaction. Psychology in the Schools, 12(3), July 1975.

Berliner, D. C., and Cahen, L. S. Trait-Treatment Interaction and Learning. In (Fred N. Kerlinger (Ed.) Review of Research in Education I.

Blanton, R. L. and Nunnally, J. C. Evaluational language processes in the deaf. Psychological Reports, 1964, 15, 891-894.

Bodner, B. and Johns, J. A study of locus of control and hearing impaired students. Paper presented at the National Convention of the A.G. Bell Association for the Deaf, Boston, Massachusetts, June 23-26, 1976.

Brecher, M. and Denmark, F. L. Internal-external locus of control and verbal fluency. Psychological Reports, 1969, 25, 707-710.

Brecher, M. and Denmark, F. L. Locus of control effects of a serendipitous manipulation. Psychological Reports, 1972, 30, 461-462.

Brown, W. F., and Holtzman, W. H. Survey of Study Habits and Attitudes Manual. The Psychological Corporation, New York, 1967.

Chance, J. E. and Goldstein, A. G. Internal-external control of reinforcement and embedded-figures performance. Perception & Psychophysics, 1971, 9(1A).

Chapman, J. W. and Boersma, F. J. Learning disabilities, locus of control, and mother attitudes. Journal of Educational Psychology, 1979, 71(2), 250-258.

Collins, B. E. Four components of the rotter internal-external scale: Belief in a difficult world, a just world, a predictable world, and a politically responsive world. Journal of Personality of Social Psychology, 1974, 29(3), 381-391.

Crandall, V. I., Katkovsky, W. and Preston, A. Motivational and ability determinants of young children's intellectual achievement behaviors. Child Development, 1962, 33, 643-661.

Diener, C. L, and Dweck, C. S. An analysis of learned helplessness: continuous changes in performance, strategy, and achievement cognitions following failure. Journal of Personality and Social Psychology, 1978, 36, 451-462.

DuCette, J., Wolk, S. and Friedman, S. Replications and refinements. The Journal of Social Psychology, 1972, 88, 297-298.

Eisenman, R. Experience in experiments and change in internal-external control scores. Journal of Consulting and Clinical Psychology, 1972, 39, 434-435.

Foulds, M. L. Changes in locus of internal-external control. A growth group experience. Comparative Group Studies, August 1971, 293-300.

Gorman, S. B. An observation of altered locus of control following political disappointment. Psychological Reports, 1968, 23, 1094.

Gozali, H., Cleary, T. A., Walster, G. W. and Cozali, J. Relationship between the internal-external control construct and achievement. _Journal of Educational Psychology_, 1973, _64_(1), 9-14.

Hallahan, D. P., Gajar, A. H., Cohen, S. B. and Tarver, S. G. Selective attention and locus of control in learning disabled and normal children. _Journal of Learning Disabilities_. April 1978, _11_(4), 47-52.

Hountras, P. T. and Scharf, M. C. Mainfest anxiety and locus of control of low-achieving college males. _The Journal of Psychology_, 1970, _74_, 95-100.

Joe, V. C. and Jahn, J. C. Factor structure of the rotter I-E scale. _Journal of Clinical Psychology_, 1973, _29_, 66-68.

Johnson, W. G. and Croft, R. G. F. Locus of control and participation in a personalized system of instruction course. _Journal of Educational Psychology_, 1975, _67_(3), 416-421.

Kleiber, D., Veldman, D. J. and Menaker, S. L. The multidimensionality of locus of control. _Journal of Clinical Psychology_, 1973, _29_, 411-416.

Kearney, M. J. and Kearney, J. F. Multidimensionality of locus of control in females. ERIC, ED 147 713, January, 1977.

Land, S. L. and Vineberg, S. E. Locus of control in blind children. _Exceptional Child_, Jan., 1965.

Lefcourt, H. M. and Telegdi, M. S. Perceived locus of control and field dependence as predictors of cognitive activity. _Journal of Consulting and Clinical Psychology_, 1971, _37_ (1), 53-56.

Lichtenstein, E. and Keutzer, C. S. Further normative and correlational data on the internal-external (I-E) control of Reinforcement Scale. _Psychological Reports_, 1967, _21_, 1014-1016.

Lipp, L., Kolstoe, R. and James, W. Denial of disability and internal control of reinforcement. Journal of Educational Psychology, 1968, 12(__), 72-75.

Lugenbuhl, J., Crowe, D., and Kahan, J. Causal attributions for success and failure. Journal of Personality and Social Psychology, 1975, 31, 86-93.

MacDonald, A. P. and Hall, J. Internal external locus of control and perception of disability. Journal of Consulting and Clinical Psychology, 1971, 36, 338-343.

MacMillan, D. L. and Wright, D. L. Outerdirectedness in children of three ages as a function of experimentally induced success and failure. Journal of Educational Psychology, 1974, 66(6), 919-925.

Messer, S. B. The relation of internal-external control to academic performance. Child Development, 1972, 43, 1456-1462.

Mirels, H. L. Dimensions of internal versus external control. Journal of Consulting and Clinical Psychology, 1970, 34(2), 226-228.

Nord, W. R., Connelly, F. and Daignault, G. Locus of control and aptitude test scores as predictors of academic achievement. Journal of Educational Psychology, 1974, 66(6), 956-961.

Nowicki, S., Jr. and Barnes, J. Effects of a structured camp experience on locus of control orientation. The Journal of Genetic Psychology, 1973, 122, 247-252.

Parent, J., Forward, J. Canter, R. and Mohling, J. Interactive effects of teaching strategy and personal locus of control on student performance and satisfaction. Journal of Educational Psychology, 1975, 87(6), 764-769.

Pedhazur, L. and Wheeler, L. Locus of perceived control and need achievement. Perceptual and Motor Skills, 1971, 33, 1281-1282.

Penk, W. E. Age changes and correlates of internal-external locus of control scale. Psychological Reports, 1969, 25, 856.

Phares, E. J. and Wilson, K. G. Responsibility attribution: Role of outcome severity, situational ambiguity, and internal-external control. Journal of Personality, 1972, 40, 392-406(b).

Powell A. and Centa, D. Adult locus of control and mental ability. Psychological Reports, 1972, 30, 829-830.

Prociuk, T. J. and Breen, L. J. Locus of control, study habits and attitudes, and college academic performance. The Journal of Psychology, 1974, 88, 91-95.

Ramanaiah, N. V., Ribich, F. D. and Schmeck, R. R. Internal external control of reinforcement as a determinant of study habits and academic attitudes. Journal of Research in Personality, 1975, 9, 375-384.

Rapoport, A. Reply to Dr. Harris comments on my comments. Psychological Reports, 1969, 25, 857-858.

Rich, H. L., and Bush, A. J. The effect of congruent teacher-student characteristics on instructional outcomes. American Educational Research Journal, 1978, 15, 451-457.

Rotter, J. B. Generalized Expectancies for internal versus external control of reinforcement. Psychological Monograph, Whole No. 609, 1966.

Shaw, R. L. and Uhl, N. P. Control of reinforcement and academic achievement. The Journal of Educational Research, 64(5), January 1971.

Simon, J. G., and Feather, N. T. Causal attributions for success and failure at university examinations. Journal of Educational Psychology, 1973, 64, 46-56.

Stebbins, P. and Stone, G. L. Internal-external control and the attribution of responsibility under questionnaire and interview conditions. Journal of Counseling Psychology, 1977, 24(2), 165-168.

Viney, L. L. Multidimensionality of perceived locus of control two replications. Journal of Consulting and Clinical Psychology, 1974, 42(3), 463-464.

Weiner, B. A theory of motivation for some classroom experiences. Journal of Educational Psychology, 1979, (1), 3-25.

Weiner, B. and Heckhausen, H. Causal ascriptions and achievement behavior. Journal of Personality & Social Psychology, 1972, 24(2), 239-248.

Weiner, B., Nierenberg, R. and Goldstein, M. Social learning (locus of control) versus attributional (causal stability) interpretations of expectancy of success, Journal of Personality, 1976, 44, 52-68.

Weiner, B. and Potepan, P. A. Personality characteristics and affective reactions toward exams of superior and failing college students. Journal of Educational Psychology, 1970, 61(2), 144-151.

Research on Motivation in Educational Settings: Implications for Hearing-Impaired Students

Michael Stinson

Research on Motivation in Educational Settings: Implications for Hearing-Impaired Students

A foremost concern in education is the creation of learning environments that are optimally motivating. Encouraging the development of particular motivational tendencies in students is itself an important educational goal. Gardner (1965) has stressed the importance to society of having individuals who are committed to achieving excellence. It is only this way that individuals and society can achieve their full potential. Another goal is the promotion of a humanistic orientation; i.e. an orientation in which the student is friendly, able to support others, empathic and tolerant of individual differences (Aronson, Blaney, Stephan, Blaney, Stephan, Sikes and Snapp, 1978). In addition, motivation is crucial for learning. A poorly motivated student will learn little, even if ability if high (Walberg and Ugoroglu, in press). Furthermore, at the post-secondary level where education is not compulsory, lack of motivation is often important underlying reason for withdrawal (White, Note 1).

Research on the importance of motivation to education has been restricted to a few populations, such as non-handicapped students from middle class backgrounds (See reviews of this work by Ball, 1977; Johnson and Johnson, 1974; Maehr, 1976; Slavin, 1977; Weiner, 1979.) In contrast, other populations of students such as those with physical disabilities have received considerably less research attention. For example, a recent review of research on deafness by by Meadow (1975) does not include a single study on the relation between motivation and educational achievement. The present paper is concerned with the motivation of hearing-impaired students, particularly those at the secondary and post-secondary levels. Research in this area might suggest instructional approaches that can increase the motivation of students, and consequently help them educationally.

The type of motivation that is most strongly elicited in class will depend upon which one is rewarded and encouraged (Slavin, 1977; Veroff, 1969). If the teacher emphasizes the comparison between the student's own performance and that of other children, he may be encouraging motivation to be competitive. If the teacher emphasizes to the students how well they are performing relative to their previous achievement, he may be encouraging motivation to be autonomous. Finally, if the teacher emphasizes "team work" and the sharing of rewards, he may be encouraging motivation to be cooperative. Each of these orientations has its benefits and drawbacks, as subsequent discussion will show. Furthermore, it seems that each orientation deserves a place in the educational program.

The reader should note that each orientation permits a variety of techniques to motivate students. For example, two classrooms with an autonomous motivational orientation may have quite different effects. In one class the material is intrinsically interesting and the student is responsible for monitoring his progress. In this class one would expect a high level of intrinsic motivation among students. In another class the material is dull and the teacher gives a grade for each lesson. In this class one would expect a lower level of intrinsic motivation. (Intrinsic motivation will be defined later.)

Individual differences are also important. A student brings with him to the classroom certain personality characteristics that will influence his interpretation of a particular motivational stimulus. The manifest response itself, however, is situation specific. Motivation is not viewed as a general personality characteristic that is highly predictive of behavior in a wide variety of situations (cf Mischel, 1973).

Figure 1 (page 5) identifies dimensions that seem important in understanding student motivation. Subsequent discussion will be concerned with these dimensions, with the effects of autonomous-, competition- and cooperation-oriented classrooms being emphasized. The first half of the paper reviews research on normally hearing students that seems to have implications for understanding the motivation of hearing-impaired students.

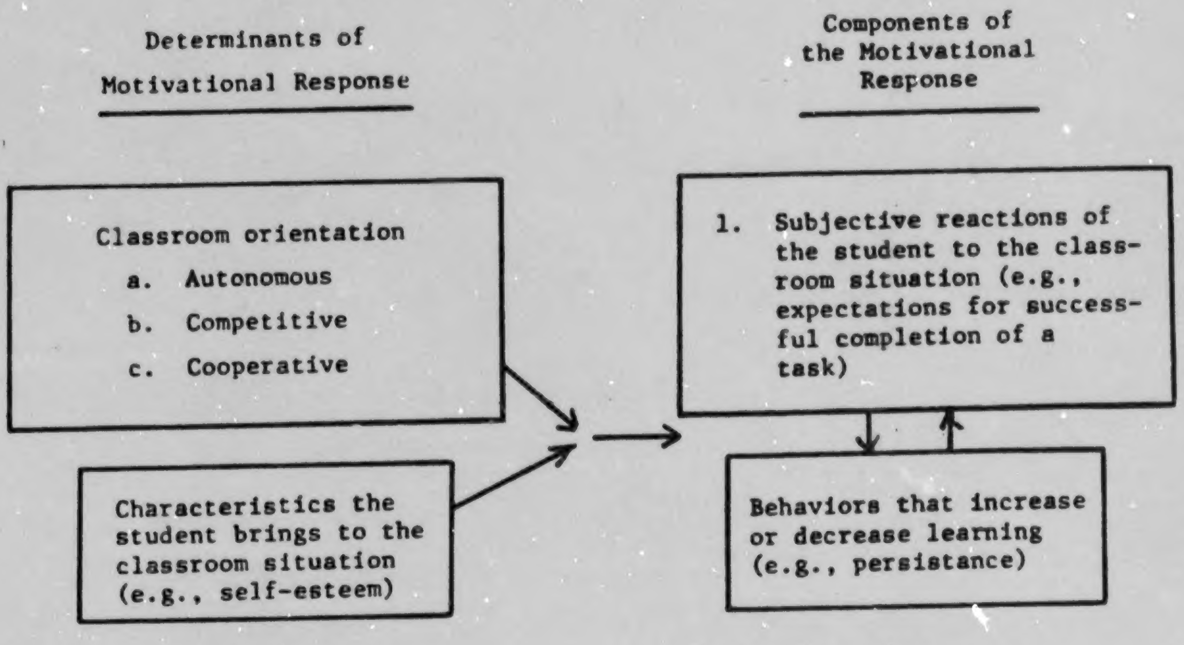
Research on Normally Hearing Students in Classrooms With Different Motivational Orientations

Autonomy-oriented Classrooms

Classrooms in which the criteria for achievement and reward are not related to other students' performance seem to encourage an autonomous orientation to achievement. Individualized instruction is an example of such a situation (Slavin, 1977).

One advantage of the classroom that encourages an orientation to one's own individual efforts rather than attending to competition is that it may be a particularly healthy way to engage in learning (Covington and Beery, 1978). An emphasis is placed upon students taking charge of certain aspects of their own learning. Students take on more responsibility for their goals, performance standards, level of aspiration and the pace at which they will

Figure 1. An Overview of Dimensions Pertaining to Motivation in the Classroom


Determinants of Motivational Response
Components of the Motivational Response
Classroom orientation
a. Autonomous
b. Competitive
c. Cooperative
Characteristics the student brings to the classroom situation (e.g., self-esteem)
1. Subjective reactions of the student to the classroom situation (e.g., expectations for successful completion of a task)
Behaviors that increase or decrease learning (e.g., persistance)

Note. Arrows indicate hypothesized direction of causality.

learn. Covington and Beery (1976) suggest that in setting goals for themselves, students need appropriate standards of achievement for evaluating their performance. One criteria that is often appropriate is that of exceeding one's own previous performance.

In order for such a criteria of performance to be an effective means for motivation, the student needs to have the ability to establish realistic goals (Covington and Beery, 1976). When the student works toward a realistic goal, he takes on personal responsibility for success. "If the student falls short of his goal, blame more naturally goes to insufficient effort since the task was manageable. By the same token, success is seen as the outcome of skillful effort (p. 109)." Research indicates that if students are encouraged to engage in such goal-setting behavior, academic performance can improve. In a mathematics class for fifth grade children using this approach, mathematics achievement increased three grade levels (Alschuler, 1969).

In addition, Covington and Beery (1976) suggest that in order for individual goal setting to serve as a primary motivational force, students need to be able to accept their limits and to be capable of rewarding themselves. Students need to realize that at any point in learning to do a complex task well, there are limits in their ability to perform. "Students must be helped to accept their limitations without devaluing themselves or their ability to learn (p. 94)". At the same time, students must be willing to accept their success when them achieve or exceed the goals they set for themselves. The pursuit of achievement depends to a significant extent on a capacity for positive self-reinforcement.

The manner in which students assume responsibility for certain aspects of their own learning has recently received considerable attention (Weiner, 1972; 1979). For example some motivational research has focused on the perceived causes of academic success and failure (Fyans and Maehr, 1979; Dweck, Davidson, Nelson & Enna, 1978; Simon and Feather, 1973). Simon and Feather (1973) suggest that students perceive "amount of preparation" as an important determinant of success on college exams. When the student engages in setting his own goals, the student is more likely to attribute responsibility for his learning outcomes to himself as opposed to task difficulty or luck.

Students' expectations for themselves seem to be important motivational determinants of academic performance. Grades students expect to obtain and the minimum grade that students will be satisfied within a particular course are significant predictors of actual grades in that course (Battle, 1965a; Uguroglu and Walberg, 1978). A possible reason that expectations predict grades is that students with higher expectations will persist at academic tasks for longer periods of time. Battle (1965b) found that junior-high school students who expect to do well in mathematics and English generally persist longer at these tasks than those who do not expect to do well.

The autonomy-oriented classroom and intrinsic motivation. Classrooms encouraging an autonomous orientation seem to create a learning environment that enhances intrinsic motivation. Deci and Ryan (1980) define intrinsic motivation as a need for competence and self--determination. Intrinsically motivated behaviors are operationally defined as those that are performed in the absence of any apparent external contingency (Deci and Ryan, 1980). When the task is intrinsically motivating, the reward is assumed to be implicit in the task itself. It seems important to include activities that are intrinsically motivating in the educational program. Experience with intrinsically motivating activities may enhance one's ability to learn independently. When the student is sensitive to the inherently interesting properties of an activity, this motivation may provide the impetus for learning independently. Whether or not a task will be intrinsically interesting depends in part upon the individual's perceptions of that task, as well as certain inherent properties of the task itself. The reader should note that, of course, there are many appropriate classroom activities that have little intrinsic interest (Bates, 1979). For these tasks the notion of intrinsic motivation has little applicability (Deci and Ryan, 1980).

When the classroom fosters (a) feelings of competence and (b) a sense of self-control, intrinsic motivation is enhanced. Deci, Nezleck and Sheinman (Note 2) hypothesized that the extent to which teachers believe in dealing with their students in a way that encourages autonomy influences the intrinsic motivation of their students. Teachers who encourage autonomy would be expected to have students with higher intrinsic motivation and perceived competence than teachers who are more controlling. Deci et. al. (Note 2) conducted a study of 610 4th-6th grade children in 35 classrooms to compare students with autonomy- and control-oriented teachers. They found that children with autonomy-oriented teachers were more intrinsically motivated; furthermore, children with autonomy-oriented teachers perceived them as providing more encouragement of personal responsibility and internal control. While this study dealt with elementary school children, there is considerable evidence demonstrating that it is possible to alter the intrinsic motivation of college students (Deci and Ryan, 1980).

Techniques for enhancing motivation in the autonomy-oriented classroom. As noted, goals set by students themselves are motivating. Goals explicitly stated by the instructor also influence students' motivation. An instructor can set nonspecific or specific goals for students. An example of a nonspecific goal is the instructor's statement "Do your best". Specific goals specify a certain level of performance for the student on a particular task. One way of providing a specific goal is to set a performance goal that is higher than the student's own previous performance. For example, the student is asked to do a set of arithmetic problems similar to those in a previous set, but to get more of the problems correct. Rosswork (1977) conducted a study with 6th grade children and found that specific goals lead to higher performance than non-specific goals on a vocabulary-learning task. Of course it is not clear whether these findings are applicable to college students.

Thus, in setting specific goals the teacher explicity identifies what it is the students should learn and establishes the level of proficiency they must reach. Furthermore, teaching is geared toward these objectives (Covington and Beery, 1976). In addition, absolute standards tend to foster a positive interpretation of failure. If there is a well-defined standard of performance, failure to achieve the standard tends to motivate the students to try harder. "In contrast, when the teacher's evaluative comments focus only on the performance itself without reference to external standards, failure tends to lower motivation (Covington and Beery, 1976, p. 104)."

"Contract grading" is another way that instructors can specify goals for their students. In one form of contract grading, the requirements for attaining each grade level are clearly specified and students are asked to sign a contract indicating the grade they are trying for. A study of college business students found that those in a class with contract grading spent almost twice as much time per week in class-related activities than those in a traditional class. Furthermore, the students perceived themselves as having greater control over the grade (Homme 1970; Polcynski & Shirland, 1977) they would receive in the class with contract grading. The two findings may be related. Under contract grading, students may feel that more effort is required to achieve a high grade, but they are willing to exert themselves because they have greater personal control over the likelihood they will attain their goal (i.e. the designated grade.).

A training program developed by DeCharms (1976) instructs students in using goal-setting processes. The emphasis of the program is to teach students to perceive goals as challenges rather than as threats. Students learn to set realistic goals based on their own probability of success. They also receive training in planning their work and in accepting personal responsibility for their actions. As a result of the training, the performance standards of the students are brought into line with their ability to attain them. DeCharms' research on the effects of the training found that inner-city children who received training: (a) had a greater sense of control of their own achievement; and (b) had a higher level of academic achievement. It would be interesting to see whether the training would also be effective with hearing-impaired college students.

Competition-oriented Classrooms

In the classroom with a competitive orientation, one student's receipt of a reward deminishes the probability that another will receive the same reward. "Grading on the curve" is an example of a competitive reward structure. If one student works especially hard to make an "A" and the number of A's is fixed, then that student's performance reduces the probability that other students will also receive A's (Slavin, 1977).

Grading on the curve provides social-comparison information. Social-comparison information can be motivating because it informs students how well they are doing or how well they could be doing (Veroff, 1969). If, after an exam, some students receive information that their test scores are higher than those of their peers, they may interpret this information as a reward that is valued in American society (Snyder, 1972). If students learn that many other students performed better than themselves, they may translate this information into a goal for future performance (Veroff, 1969). Thus, when social-comparison information is provided in the classroom, it constitutes a means for evaluating effort and for determining one's level of achievement.

Harackiewicz (1979) compared the effect of social-comparison information with that of information pertaining to an experimenter provided goal. In the former case, feedback was given stating that the student did better than the average student; in the latter case, the feedback given was that the student had attained the experimenter provided goal. Students receiving the social-comparison feedback showed higher levels of perceived competence. One interpretation of this result is that the social-comparison condition provided more information indicating that the student was competent. In a related study, Ames and Felker (1979) found that children were more satisfied with their performance when they learned they had performed successfully in a situation where the reward was based on competition than when they had performed successfully in a situation where the reward was based upon cooperation or individual effort.

It would seem that in order for teachers to effectively manage classrooms with a competitive orientation, they would need to be aware of the motivational processes in the situation. In this situation, the relationship between one's self evaluation of abilities and actual academic performance is influenced by the student's perceived standing in relation to peers; i.e. the students' perception of their own competence is based upon the comparison of abilities with peers (Rogers, Smith, and Coleman, 1978). Furthermore, when students perceive their peers as expecting themselves to be motivated, they are more likely to expend effort in the classroom than when they do not perceive their peers as expecting themselves to show high motivation (Mitchell and Nebeker, 1973).

There is considerable variation among students in their reactions to a competitively-oriented classroom (Crandall, 1969; Halperin and Abrams, 1978). For example, Halperin and Abrams suggest that women students who enjoy challenging situations and who tend to assume responsibility for their own performance have higher expectations concerning their own performance in a course than do women students who do not enjoy challenges and who tend to avoid responsibility.

An important consideration for the teacher is whether a particular motivational approach facilitates learning. Social-comparison information seems most facilitative when the task is simple. McClintock and Van Avermaet (1975) compared the effect of social-comparison feedback comparison of others performance with one's own) with that of self-comparison feedback (comparison of current performance with one's own previous performance) for two tasks: (a) crossing-out numbers, and (b) paired associate learning. For the simple task, performance was higher under the social feedback condition than under the self feedback condition. On a more complex, paired-associate learning task, however, there was no difference in performance under social and self comparison feedback conditions. In this situation and in similar circumstances in other studies (e.g. Johnson, Skon and Johnson, 1980), one finds that a competitive situation does not necessarily result in optimal learning. A competitive classroom can generate too much concern about winning and too much anxiety about losing. Thus, the competitive situation seems to have an effect similar to that of high-magnitude reinforcers. Masters and Mokros (1973) have pointed out that high-magnitude incentives sometimes retard performance on learning tasks because students become preoccupied with the reinforcer and distracted from the task. If a task is complex, and if social-comparison feedback constitutes a high-magniture incentive, students may perform poorly because they are distracted from learning the cues and actions that are necessary for the correct response.

Negative consequences of classrooms with a competitive orientation. In a competitive situation it is possible for the student to be overly concerned about his performance in relation to the group norms. Veroff (1969) suggests that excessive concern occurs when the social-comparison dominates the student's basis for esteem. Such a student does not treat social-comparison information objectively and does not use the information to discover ways to improve his performance.

Another unhealthy response to social comparison occurs when the competitive situation generates considerable anxiety in the student. Such students are concerned about doing poorly relative to peers; furthermore, they believe that one possible consequence of doing poorly is that they will receive disapproval either from peers or from the instructor (Veroff, 1969).

Covington and Omelich (1979) suggest that many students adopt certain strategies so that they will not suffer too much humiliation in situations where they perceive themselves as failing. Students are most likely to adopt such strategies when there is grading on a curve. Grades are threatening because they signal success or failure, and the possibility of failure is always eminent. In the competitive grading systems the rewards are fixed so that for one student to feel successful, others must experience failure. Given this situation, the optimal strategy is to put a limited amount of effort into an academic task; however, do not try too hard, for it is important to have excuses. Students are afraid that if they try they will fail. "It is difficult to imagine a strategy better calculated to sabotage the pursuit of personal excellence (p. 178)." Covington and Omelich provided evidence to support their contentions in a study of students' responses to a hypothetical achievement situation involving failure on a college exam. Student's were asked to imagine themselves as having failed the test. Students viewed themselves as most incapable and expressed the greatest amount of dissappointment in themselves when the failure followed extensive preparation for the exam. However, if the students had an excuse for their failure they were not as dissappointed in themselves. In a related study, Snyder and Katahn (1970) found that students expressed dissappointment in themselves following feedback that they had done poorly on an exam.

Another drawback of the competition-oriented classroom is that it is the situation most likely to discourage intrinsic motivation. Deci, Betley, Kahle, Abrams and Porac (in press) have reported results in support of the hypothesis that the focus on winning induced by the competitive situation reduces intrinsic motivation.

Dealing with the problems generated by a competition-oriented classroom. It has been pointed out that a competition-oriented classroom sometimes interferes with learning. It is also clear, however, that students need practice so that they can learn to deal with competitive situations where their performance is important to them and where it will be evaluated. The Scholastic Aptitude Test is one example of such a situation. Another example is applying for a job when there is more then one applicant. In order to deal effectively in a competitive situation, students need to view the competitive situation objectively. They need to treat the situation as one that will provide information rather than as an anxiety provoking event. Students can be more objective if they realize that they often have a choice between engaging in a competitive activity or a non-competitive one. Furthermore, they need to realize that one's achievement in competition is only a part of one's self, and the evaluation of one's self is also influenced by other considerations.

Teachers can take steps to reduce the most debilating effects of competition. Anxiety over the possibility of receiving a low or failing grade can be reduced by providing students some degree of control over the grades they will receive and a guarantee against receiving a failing grade. One way to institute this guarantee is for the teacher to establish a minimum grade, say a C, which is assured for meeting the basic requirements (Beery and Covington, 1976; Harrison, 1969). This procedure might mean establishing a minimal level of mastery acceptable to the teacher.

Another technique a teacher can use for presenting social-comparison information is to provide students a relative low level of performance against which to compare themselves. Snyder (1972) compared the performance of students in an introductory psychology course when the standard of comparison for evaluating performance was either high, medium or low. Student's receiving the low comparison level (in which 90% of the subjects exceeded the standard) showed the highest performance. Snyder (1972) suggests that the students who received positive reinforcement regarding their performance may have been more highly motivated to continue to learn the material. On the other hand, when the the standard of comparison was high, students may have become discouraged and not continued to pay attention and study.

An instructor can also take deliberate steps to reduce the level of anxiety that students experience in a competition-oriented classroom. The procedures involve retraining students so that the student attends more fully to the task at hand rather than worrying about failure (Beery and Covington, 197).

Cooperation-oriented Classrooms

In the classroom with a cooperative orientation, an increase in the performance of any student in the group increases the probability that the group will receive a reward which will be shared by all members. An example of such a classroom situation is one in which there is a group project and the teacher assigns the same grade to all members of the group participating in the project.

A major benefit of the cooperative situation is that it facilitates learning on problem-solving tasks. On the whole, studies comparing performance on such tasks have reported higher performance for the cooperative setting than for those oriented toward autonomy or competition (Johnson, Skon and Johnson, 1980; Johnson and Johnson, 1975). Johnson, Skon and Johnson (1980) suggest three factors that can account for superior performance in the cooperative setting: (a) Students develop superior problem-solving strategies in group work; (b) the medium and low ability students benefit from the interaction with the high ability students, and (c) group work fosters motivation to achieve. In a study comparing each of these factors in autonomy-, competition-, and cooperation-oriented classrooms, Johnson, Skon and Johnson had students perform three problem-solving tasks. The cooperative situation consisted of groups of students who were instructed to work together as a group to share materials and ideas, to help each other, and to ensure that each member was involved. In these groups the members were responsible for agreeing on the answers and for learning the material. The quality of the problem-solving strategies students used was observed for each type of classroom. They found that students used superior strategies in the cooperative condition. A key factor was the discussion among students. Students at all ability levels seemed to gain insights from the cooperative discussion. In addition, cooperative interaction seemed to generate perceptions of more support and encouragement for achievement than did the other two conditions.

Not all research on cooperative settings, however, indicates that this setting yields more positive motivational effects than autonomy- or competition-oriented settings. Ames and Felker (1978) suggest that when there is group failure, evaluations of individuals are harsher than in autonomy- or competition-oriented settings. Furthermore, when students were successful on a puzzle task, they were more satisfied with their performance in competitive and autonomous conditions than in the cooperative one. Most of the studies dealing with the effects of cooperation in the classroom have used children as subjects (e.g. Johnson, Skon and Johnson, 1980; Slavin, 1978, Ames and Felker, 1978). However, the findings from these studies appear applicable to college settings. Experiments on the effects of cooperation upon college students' performance on laboratory tasks are consistent with the findings obtained with children (Laughlin, 1978).

Aronson et. al. (1978) have developed a procedure for creating a cooperative orientation in the classroom. The key ingredient in their approach is to create a learning process in which it is imperative that students treat each other as learning resources. The learning process is structured so that individual competitiveness is incompatible with success; furthermore, the process is designed so that success can occur only after cooperative behavior has occurred. The process has acquired the name "Jigsaw Classroom" since it is highly reminsicent of a jigsaw puzzle. Students form groups and each student in the group is responsible for teaching part of a lesson. Students are tested for knowledge of all the material, but only one student presents the material for a particular part. Consequently, both interdependence and active learning are required. Evaluative research on this procedure indicates that a cooperation-oriented classroom can increase student's liking of school, self-esteen and willingness to use classmates as learning resources. Furthermore, students master classroom material as well as they do in traditional classrooms.

Slavin (1978) has also developed a procedure for creating a cooperation-oriented classroom in which student teams are used. In this procedure, students are assigned to 4 and 5 member teams consisting of students at various levels of ability. Students work together during study periods to help each other learn the material. Students, however, take tests individually. Feedback is given in two ways; as a team score, and as social-comparison information where students are compared with others of the same ability level. In a comparison of performance in this setting and in a competition-only condition, Slavin (1978) found that participation in the team treatment increases time spent on the task and leads to perceptions of increased mutual concern and peer support. The two treatments, however, did not make a difference with respect to the academic achievement of the students in an English unit on language mechanics.

The discussion of research on normally hearing students has raised a number of issues that seem to have implications for understanding the motivation of hearing-impaired students. The remainder of the paper will consider these issues and review research on the psychological characteristics of hearing-impaired students in order to make suggestions concerning the motivational determinants of hearing-impaired students.

Research with Hearing-Impaired Students:

Implications for Classrooms with Different Motivational Orientations

Autonomy-oriented Classrooms

Are hearing-impaired students motivated in autonomy-oriented classrooms? Two studies conducted with hearing-impaired children suggest that settings oriented toward autonomous achievement can be motivating. Elliot and Vegeley (1969) investigated the effects of motivation and practice upon performance of a task requiring sequential coding of information. Pennies were placed on the coding sheet so that it was apparent that the faster children could code, the larger the reward they would receive. This manipulation can be viewed as an autonomous one since the criteria for reward was not related to other children's performance. In the no reward condition the performance of the hearing-impaired children was lower than that of the normally hearing children. In the reward condition, however, the performance of the hearing-impaired children increased to the same level as that of the normally hearing children. This set of results suggests that the hearing-impaired children's deficit in performance may have been partly due to motivational factors; otherwise these children would not have been able to so rapidly overcome the performance deficit. Although this research indicates that hearing-impaired children can be motivated by an autonomous orientation toward achievement, the question remains of why the hearing-impaired children performed at a lower level in the control condition? A possible explanation is that the deaf children did not impose upon themselves a standard of performance that was motivating, while the normally hearing students did spontaneously impose such a standard upon themselves.

Stinson (1974) investigated hearing-impaired boys' motivational predisposition toward autonomous achievement standards. The criteria for achievement was based upon the child's own previous performance. There was no significant difference in the tendency of the hearing-impaired and normally hearing boys (8-13 years of age) to select moderately difficult tasks when the standard was autonomous. Thus, in this particular instance, the motivational orientations of the two groups seemed similar.

Educational goals. An important assumption concerning the motivation of students is that students work toward goals, even if the goal is simply earning a good grade. If the instructor is going to motivate the students, there must be some goals that the students perceive as important. There are individual differences in the extent to which hearing-impaired students perceive the goals of a course as important. Meath-Lang (1978) compared hearing-impaired students having full-time work experience with hearing-impaired students without this experience in terms of the extent to which they valued certain instructional goals in an English course. For example, one of the items in the questionnaire was, "Language classes are very important to me". She found that students having work experience considered the goals of English instruction more valuable.

It has already been pointed out that the manner in which the teacher establishes goals for students influences their motivation. For example goals that specify a certain level of performance on a particular task can be more motivating than general goals, such as "get a good grade". It seems that it would be instructionally useful to determine to what extent hearing-impaired students are motivated when given general versus specific goals.

Another issue for research is to determine whether the goals that students set for themselves influence academic performance. When students set higher goals for themselves, do they devote more effort to the course and consequently show higher performance?

Expectations for performance. The expectations of hearing-impaired students reflect, to some extent, their actual abilities, as is the case for their normally hearing peers. A study by Rutledge (1954) suggests that tasks on which hearing-impaired students generally perform as well as normally hearing peers, their expectations for success are generally similar to those of their peers. On the other hand, on tasks on which hearing-impaired students generally do worse than their normally hearing peers, their expectations for success tend to be correspondingly lower.

Research with normally hearing students indicates that it is possible to change students' expectations for their own performance so that these expectations are more congruent with the student's present level of skill; furthermore, these changes in expectations can lead to increased motivation (DeCharms, 1976). With respect to hearing-impaired students, Mckee, Stinson and Blake (Note 3) found that it is possible for students to change self-estimates of their ability so that they more accurately reflect their actual ability. Freshmen enrolled in a communication course at the National Technical Institute for the Deaf, a post-secondary institution, rated their communication ability before and after the course. Correlational analyses indicated that the accuracy of self-ratings increased significantly from pre- to post-course measures in each of several communication modes. Self estimates of ability are not identical to expectations for performance in a course, but the two processes are related (Diggory, 1969).

Self-estimates of ability are related to academic performance. Studies with hearing-impaired high school students indicate that students' opinions about their own academic ability account for substantial variance in predictions of academic achievement (Joiner, Erickson, Crittenden and Stevenson, 1969). This conclusion concerning the importance of self-esteem for hearing-impaired students is similar to conclusions drawn for normally hearing students in studies involving the same variables (Joiner et. al., 1969; Brookover, Note 4).

There is a need for further work in this area; especially, to identify techniques that can help hearing-impaired students establish positive but realistic expectations for themselves.

Potential difficulties of hearing-impaired students in the autonomy-oriented classroom. There is evidence that hearing-impaired students generally have lower self-esteem than normally hearing students (Garrison and Tesch, 1978; Schroedell and Schiff, 1972). (See, however, the reservations about this conclusion, e.g. Garrison, Tesch and DeCaro, 1978). Level of self-esteem influences the way people interprete all kinds of situations (e.g. Zajonc and Brickman, 1979). For example, students with high self-esteem may treat failure as information useful for future study, whereas students with low self-esteem may regard failure as an anxiety provoking experience.

A study by McCrone (Note 5) suggests that hearing-impaired sudents with low self-esteem are distracted by a failure experience. In the study, the problem-solving performance of hearing-impaired high school students who were severe underachievers was disrupted by prior experience with an unsolvable problem. In contrast, the performance of students who were at a higher level academically was not disrupted by the prior experience of failure. One interpretation of this finding is that the underachievers had lower self esteem and they experienced more anxiety following failure. Thus, their ability to perform was disrupted.

In order for students to be motivationally predisposed toward an autonomy-oriented classroom, it may be critical for them to believe that personal effort is an important determinant of the outcome of events (Veroff, 1969). If students do not believe that personal effort is important, they may not exert themselves because they do not see the relationship between their efforts and goal attainment.

In general, the published descriptions of hearing-impaired students describe them as having less of a sense of responsibility for their own actions than do normally hearing counterparts. Meadow (1976) described hearing-impaired students as dependent, and Bodner and Johns (1978) concluded that they tend to have an externally-oriented locus of control.

In spite of the apparent unwillingness of hearing-impaired students to accept personaly responsibility, those who have been successful in mainstreamed college settings seem to recognize that assuming personal responsibility for performance is essential for college success, perhaps more so than for normally hearing students. A survey of hearing-impaired students attending regular colleges included questions about reasons for success. Among the most frequent answers were (a) being self-competent, (b) taking the initiative in getting special help, and (c) having good study habits (Quigley, Jenne and Phillips, 1968). Having a sense of responsibility seems to be implicit in each of these factors.

In the mainstreamed classrooms, the provision of support services such as interpreting, notetaking and tutoring may foster dependency. It is not clear to what extent students perceive their achievement as being due to their own efforts and skills as opposed to being due to the help derived from support services. Consider student perceptions of tutoring as an example of a research question in this area. Does use of tutoring reduce the perceived importance of studying? Students may believe that in order to benefit from tutoring it is also necessary to study. On the other hand they may not study as hard when they know they can easily get help.

Classroom settings that encourage an autonomous motivational orientation would seem to be well suited for deliberate training to enhance personal responsibility. There is a need for the development of appropriate instructional procedures, as well as for research to determine the extent to which such procedures enhance one's sense of responsibility.

Competition-oriented Classrooms

Are deaf students motivated by the competitive setting? On the basis of a few studies, the answer seems to be "yes" (Stinson, 1974; Meadow 1972; Bodner & Johns 1976). These studies suggest that the motivation may be of an "unhealthy" kind: Students are sensitive to comparisons between their own performance and that of others because they are afraid that if they do not meet group standards they will be rejected by the group. Furthermore, group acceptance/rejection is an unduly important determinant of self esteem. Given this orientation, evaluation situations, especially those in group settings, provoke anxiety (Birney, Burdick and Teevan, 1969).

Stinson (1974) compared the responses of hearing-impaired and normally hearing boys in a setting with a competitive standard in which the criteria for performance was based upon the norms of a reference group. The normally hearing boys more frequently selected the challenging social comparison task than did the hearing-impaired who tended to select the easy task. The behavior of the hearing-impaired boys may reflect a motivational tendency to avoid challenging social comparison situations.

Research by Meadow (1972) suggests that hearing-impaired children engage in social comparison concerning their deafness. Hearing-impaired students in day schools perceive hearing persons as more rejecting of them and are rated by teachers as less adjusted to deafness than those in a residential school. More frequent unfavorable comparison by day school children between themselves and their hearing family and schoolmates may explain the difference.

The extent to which hearing-impaired students treat competitive situations as either (a) information providing or (b) anxiety provoking may depend upon the situation. For example, a hearing-impaired student may feel anxious when he is in a mainstreamed class that has an instructor who grades on the curve and who is a hard grader. The student may feel relaxed in a social situation having a competitive element in which all the participants are hearing-impaired.

Even if the student identifies with other hearing-impaired students, he may still use normally hearing peers as a comparison group. Research has shown that individuals not necessarily perceiving themselves as members of a particular social group will still use it for cross-group comparison (Epps, Perry, Katz, and Runyan, 1971). Thus, even if the hearing-impaired student performs at a level which is more comparable to that of other hearing-impaired students than to that of normally hearing students, he may still use them as a comparison group. Even when people are repeatedly told they are performing below group norms, they often continue to use higher performing persons as a reference group (Dreyer, 1953).

In addition, Emerton, Hurwitz and Bishop (1979) suggest that hearing-impaired people may sometimes perceive a double message with respect to their status in the "hearing world". On one hand, the placement of hearing-impaired students in the same educational environments as normally hearing people conveys the impression that hearing-impaired students are expected to compete with normally hearing peers. On the other hand, hearing-impaired students sometimes perceive normally hearing persons as having negative attitudes toward deafness (Schroedel and Schiff, 1972). Such a stance conveys a suggestion that hearing-impaired students are not viewed as capable of competing with normally hearing students.

The extent to which students perceive themselves as capable of competing with normally hearing peers may depend upon the skill that is being compared. Conversations with students at NTID suggest that an area in which they perceive themselves as less competent is the reception of lecture information. Although interpreters are used extensively to help hearing-impaired students better follow the classroom lectures, these students may still not comprehend as much information as do normally hearing peers (Jacobs, 1977). Although it is appropriate for hearing-impaired students to be aware of difficulties in understanding lecture information, it is possible that they overestimate the comprehension skills of normally hearing students. If the perceptions of the hearing-impaired students exaggerate their own relative difficulties in lecture comprehension, this perception may lead to expectations for a level of performance in the classroom that is lower than the level at which they are capable of performing. On the other hand, there may be other areas where they do not perceive themselves as less capable than their normally hearing peers; for example, hearing-impaired drafting students may generally perceive themselves as just as capable of successfully completing their assignments as are their normally hearing peers.

The extent to which a hearing-impaired student perceives himself as capable of competing successfully with normally hearing students may depend in part upon whether he believes the world at large provides opportunities to satisfy needs for achievement. This perspective may be viewed as one dimension of the hearing-impaired person's life space. Meyerson (1963) defines the life space as the psychological environment that is meaningful and relevant to the individual. He evaluates the hearing-impaired person's life space in terms of the extent to which a person participates in education, social activities and work with fellow hearing-impaired individuals or with normally hearing people. Hearing-impaired students are assumed to vary in the extent to which their life space is oriented to the world at large or to the deaf community, depending upon a variety of personal characteristics and background factors. In view of the above considerations, it seems important to study the social comparisons of hearing-impaired students in mainstreamed classes.

Techniques for competition-oriented classrooms. There is a need for procedures that can make students more comfortable in settings where the criteria for achievement involve comparisons of the student with other students. The following techniques may help hearing-impaired students feel more comfortable and learn more effectively; moreover, these procedures seem particularly applicable to mainstreamed classrooms and for the preparation of students to participate in such classrooms.

1. As suggested by Covington and Beery (1976), the teacher can establish a minimum grade for the course. This could provide some assurance to the hearing-impaired students that they will not get a low or failing grade in spite of the fact they may be competing with normally hearing peers.

2. The course instructor can create a setting where the standard for evaluation is fair to the students, handicapped and nonhandicapped. It is important that the teacher evaluate student's performance on the basis of the quality of the content, not in terms of whether the presentation form is standard or nonstandard (Harris, 1978). For example, if the teacher is nonsigning, and the student uses signs and his or her speech is distorted, does the teacher downgrade the evaluation of the student's response? It seems that students will be more motivated if they believe their utterances will be treated fairly by the teacher.

3. Students are place in a mainstreamed class that contains other hearing-impaired students. Strang, Smith Rogers (1978) suggest that when a class contains both handicapped and nonhandicapped students, the handicapped students are free to compare themselves with each reference group, depending upon which one is more appropriate for the particular comparison. On the other hand, if there is no reference group of hearing-impaired peers, these students must use the reference group of normally hearing students, even when it may not be appropriate.

4. Hearing-impaired students can be made aware of strategies for successful learning in the mainstreamed classroom. For example hearing-impaired students can be informed that they can arrange meetings involving a tutor, the course instructor and the student and that such meetings are helpful in identifying material to be studied prior to exams. Opportunities can be provided where experienced students can share with inexperienced students the strategies they have found successful for coping in the mainstreamed classroom. Such information can increase the confidence of hearing-impaired students that they can compete successfully with normally hearing peers.

Cooperation-oriented Classrooms

There are no known studies dealing with the motivational effects of cooperative settings upon hearing-impaired students. As noted, research with normally hearing students suggests that the cooperative setting can have positive motivational effects, including: (a) Increased time spent in learning, (b) greater peer support, (c) increased enjoyment of learning and (d) higher self esteem. The use of cooperative techniques with hearing-impaired students needs to be evaluated. Membership in cooperation-oriented classrooms can consist of (a) only hearing-impaired students; (b) some hearing-impaired and some normally hearing students. An obvious variable for study would be the expectations of the hearing-impaired and normally hearing students for cooperating with each other in spite of the communication barriers. Perceived ability to work together may depend upon the class and the nature of the task. For example hearing-impaired and normally hearing students may have higher expectations of success when much of the communication can be nonverbal. Cooperation may be possible, however, even when much of the communication is verbal. For example, a Rochester Institute of Technology social work instructor has reported having successful class sessions where normally hearing and hearing-impaired students are required to work in small groups.

Conclusions and Recommendations

Since virtually no research has been conducted on the motivation of hearing-impaired students, the discussion of motivational determinants of hearing-impaired students has been quite speculative. It is possible, however, on the basis of present knowledge, to make suggestions concerning the motivation of hearing-impaired students. The first suggestion is to provide students with a balanced exposure to classrooms with different motivational orientations: Autonomous, competitive and cooperative. Second, it seems desirable to foster in students a capacity to recognize classroom situations with different motivational orientations and to be able to direct their efforts accordingly.

In most educational settings, the provision of a balanced exposure to different motivational orientations implies that the competitive orientation will receive less emphasis while the autonomous and cooperative orientations will receive more emphasis (Aronson, et. al., 1978). The educational system in our society from grade school through college is largely competitive (Madsen and Shapira, 1970). The idea of providing a balanced exposure to the different motivational orientations is not a novel one (Aronson, et. al., 1978; Garibaldi, Note 6).

A balanced exposure to different motivational orientations is important because it may help the student develop strategies for adapting successfully to various school and work settings. At school, and subsequently at work, the individual will encounter situations with different motivational orientations. In general, the most facilitative way to perform a task is to adapt one's way of responding to the predominant motivational orientation. In addition, there does not seem to be any reason why autonomous competitive and cooperative techniques cannot co-exist in the same classroom. Research suggests that each motivational orientation can be part of the classroom process without depletion of the benefits of each (Blaney, N., Stephan, C. Rosenfeld, D; Aronson, E. & Sikes, J., 1977).

Students vary in the extent to which they respond to classrooms with different motivational orientations (Veroff, 1969). Providing students practice under each motivational orientation may be one way of increasing student's sensitivity to each orientation. For example, at first, many students do not direct their efforts appropriately in a cooperative situation, but with practice, they learn to do so (Aaronson et. al., 1978). Another approach for fostering appropriate motivational responses to different situations would be through counseling. For example, if the student is very anxious in the competition-oriented classroom, the student might go through a series of exercises that provide training in attending to task relevant factors during test performance (Wine, 1973).

Reference Notes

1. White, Karl R. *A summay report of an evaluation of NTID'S 1977 summer Vestibule program* (Report #1). March 1978.
2. Deci, E. L. & Ryan, R. Experimental exploration of intrinsic motivational process, In Berkowitz, L. (Ed.), *Advances in Experimental Social Psychology*. New York: Acedemic Press, 1980, *13*.
3. McKee, B. G., Stinson, M. S., & Blake, R. S. *Percieved versus measured* communication ability of deaf college students. Paper presented at the Annual Meeting of the American Educational Research Association, Boston, April 1980.
4. Brookover, W., Erickson, D. & Joiner, L. *Self concept of ability and school achievement III* (Report of Cooperative Research Project 2831). U.S. Office of Education, Mich.: Bureau of Educational research Services, College of Education, Michigan State Univ., 1967.
5. McGrone, W. *The Effects of experimentaly induced expectancies on performance in selectad deaf adolescents: An investigation of learned helplessness*, 1977, unpublished doctorial dissertation, RIT Film 6129.
6. Dreyer, A. *Behavior in a level of aspiration situation as affectef by group comparision*. Unpublished doctorial dissertation, University of Minnesota, 1953.
7. Garibaldi, A. *Cooperation, competion, individualization, and black students' problem solving attitudes.* Paper presented at the annual meeting of the American Psychological Association, September 1977.

References

Aronson, E., Blaney, N., Stephan, C., Sikes, J. and Snapp, M. *The jigsaw classroom*. Beverly Hills, Calif.: Sage Publications, 1978.

Alschuler, A. The effects of classroom structure on achievement and academic performance. *Educational Technolgy*, 1969, *9*, 19-24.

Ball, S. (Ed.) *Motivation in education*. New York: Academic Press, 1977.

Bates, John A. Extrinsic Reward and Intrinsic Motivation: A Review with Implications for the Classroom. *Review of Educational Research*, Fall, 1979, *49*, 557-576.

Battle, E. Motivational determinants of academic competence. *Journal of Personality and Social Psychology*, 1965, *4*, 634-642.

Battle, E. Motivational determinants of academic task persistance. *Journal of Personality and Social Psychology*, 1965, *2*(2), 209-218.

Birney, R. C., Burdick, H., & Teevan, r. c. *Fear of failure.* New York: Van Nostrand, 1969.

Blaney, N. T., C. Stephan, D. Rosenfield, E. Aronson, and J. Sikes. Intedependance in the classroom: A field study. *Journal of Educational Psychology*. 1977, *69*, 121-128.

Bodner, B., & Johns, J. Personality and hearing-impairment. A study in locus of control. *Volta Review*, 1977, *79*, 362-372.

Crandall, V. C. Sex differences in expectancy of intellecual and academic *reinforcement*. In C. Smith (Ed.) *Achievement-related motives in children*. New York: Russel Sage Foundation, 1969.

Covington, M. U. & Beery, R. *Self-worth and School Learning*. New York: Holt, Rinehart and Winston, 1976.

Covington, M. U. & Omelich, C. L. Effort: the double-edged sword in school achievement. *Journal of Educational Psychology*. 1979, *71*(2), 169-182.

De Charms, R. *Enhancing Motivation: Change in the Classroom*. New York: Irvington, 1976.

Deci, E., Betly, G., Kahle, J., Abrams, L. and Porac, J. When trying to win: competition and intrisic motivation. *Personality and Social Psychology Bulletin*, in press.

BEST COPY AVAILABLE

Deci, E. L. & Ryan, R. Experimental exploration of intrinsic motivational process. In Berkowitz, L. (Ed.). *Advances in Experimental Social Psychology*. New York: Acedemic Press, 1980, *17*.

Diggory, J. *Self-evaluation: Concepts and studies*. New York: Wiley, 1969.

Dreyer, A. *Behavior in a level of aspiration situation as affected by group comparison*. Unpublished doctoral dissertation. University of Minnesota, 1953.

Dweck, C. S., Davidson, W., Nelson and Enna, B. Sex differences in learned helplessness, the contingencies of evalutative feedback in the classroom, and an experimental analysis. *Developmental Psychology*, 1978, *14*, 368-276.

Elliott,L., & Vegely, A. Effect of reward on speed of coding for normal and hearing-impaired children. *Psychonomic Science*, 1969, *15*, 73-74.

Emerton, G., Hurwitz, T., Bishop, M. Development of social maturity in deaf adolescents and adults. In L. Bradford and W. Hardy (Eds.) *Hearing and hearing impairment*. New York: Grune & Stratton, 1979.

Epps, E., Perry, A., Katz, I., and Runyon, E. Effect of race comparison reference and motives on Negro cognitive performance. *Journal of Educational Psychology*, 1971, 62:3, 201-208.

Fyans, L. J., Jr. & Maehr, M. L. Attributional style, task selection, and achievement. *Journal of Educational Psychology*, 1979, *71* (4), 499-507.

Gardner, J. W. *Self-renewal*. New York: Harper & Row, 1965.

Garrison, W. M. & Tesch, S. Self-concept and deafness: A review of the research literature. *The Volta Review*, 1978, *80*, 457-466.

Garrison, W., Tesch, S., & DeCaro, P. An assessment of self-concept levels among postsecondary deaf adolescents. *American Annals of the Deaf*, 1978, *123*, 968-975.

Halperin, M. S. & Abrams, D. L. Sex differences in predicting final examination grades: the influence of the past performance, attributions, and achievemrnt motivation. *Journal of Educational Psychology*, 1978, *70*(5), 763-771.

Harackiewicz, J. The effects of reward contingency and performance feedback on intrinsic motivation. *Journal of Personality and Social Psychology*, 1979, *39*, 1352-1363.

Harris, A. The development of the deaf individual and the deaf community. In. L. Liben (Ed.) *The development of the deaf individual and the deaf community*. New York: Academic Press, 1978.

Harris, R. Impulse control in deaf children: Research and clinical issues. In. L. Liben (Ed.) *Deaf children: A developmental perspectives.* New York: Acedmic Press, 1978.

Harrison, R. Classroom innovation. In P. J. Runkel, R. Harrison, & M. Runkel (Eds.), *The changing college classroom*. San Francisco : Jossey Bass, 1969.

Homme, L. How to use contingency contracting inthe classroom. Champaign, Ill.: Research Press, 1970.

Jacobs, L. The efficiency of interpreting input for processing lecture information by deaf college students. *Journal of Rehabilitation for the Deaf*, *11*, 1977.

Johnson, D. W. & Johnson, R. T. Instructional goal structure: cooperative, competive or individualictic. *Review of Educational Research*, 1974, *44*, 213-240.

Johnson, D. W. & Johnson, R. T. *Learning together and alone. Cooperation, Competition and individualization*. Englewood Cliffs, N. J.: Prentice- Hall, 1975.

Johnson, D., Skon, L. & Johnson, R. Effects of cooperative, competive and individualistic conditions on children's problem solving performance. *American Educational Research Journal*, 1980, *17*, 83-85.

Joiner, L. M., Erickson, E. L., Crittenden, J. B., & Stevenson, V. M. Predicting the acadimic achievement of the acoustically-impared using intelligence and self-concept of academic ability. *Journal of Special Education*, 1966, *3*, 425-431.

Laughlin, P. Abilty and group problem-solving. *Journal of Research and Development in Education*,1978, *12*,114-120.

Mc Clintock, C. G. & Van Avermal, E. The effects of manipulating feedback upon children's motives and performances: a propositional statement and empirical evaluation. *Behavioral Science*, 1975, 20, 101-116.

Machr, M. L. Continuing motivation: an analysis of a seldom considered educational outcome. *Review of Educational Research*, 1976, *46*,443-462.

Masters, J. C. & Mokros, J. Effects of incentive magnitude upon disrimination learning and choice preference in young children. *Child Development*, 1973, *44*, 225-231.

Meadow, K. P. Developmental problems of deafness during the school years. In H. Schlesinger and K. Meadow (Eds.) *Sign and sound*. Berkley, Calif.: University of California Press, 1972.

Meadow, K. P. The development of deaf children. In E. Heatherington, J. Hagen, R. Kron and A. Stein (Eds.) *Review of child development research* (Vol. 5) Chicago, Ill.: University of Chicago Press, 1975.

Meadow, K. P. Personality and social development of deaf persons. In B. Bolton (ed.) *Psychology of deafness for rehilitation counselors*. Baltimore, MD: University Park Press, 1976.

Meath-Lang, B. A comparitive study of experienced and non-experienced groups of deaf college students: Their attitudes toward language learning. *Teaching English to the Deaf*, 1978, *5*, 9-14.

Meyerson, L. A psychology of the hearing impaired. In W. Cruichshank (Ed.) *Psychology of exceptional children and youth*. New York: Prentice-Hall, 1963.

Mischel, W. Toward a cognitive social learning reconceptionualization of personality. *Pschological Review*, 1973, *80*, 252-283.

Mitchell, T. R. & Nebecker, D. M. Expectancy theory of predictions on academic effort and performance. Journal of Applied Psychology, 1973, 57, 61-67.

Polczynski, James J. Expectancy theory and contract grading comvined as an effective motivational force for college students. Journal of Educational Research, May - June 1977, 70(5), 238-241.

Quigley, S., Jenne, W., and Phillips, S. Deaf students in colleges and universities. Washington, D. D.: Alexander Graham Bell Association for the Deaf, 1968.

Rogers, Carl, et. al. Social comparison in the classroom: the relationship between academic achievement and self-concept. Journal of Educational Psychology, February 1879, 70, 50-57.

Rosswork, S. G. Goal setting: the effects on an academic task with varying magnitudes of incentive. Journal of Educational Psychology, December 1977, 69(6), 710-715.

Rutledge, L. Aspiration levals of deaf children as compared with those of hearing children. Journal of Speech and Hearing disorders, 1954, 19, 375-380.

Schroedel, J. G., & Schiff, W. Attitudes towards deafness among several deaf and hearing populations. Rehabilitation Psychology, 1972, 19, 59-70.

Shapira, A. and Madsen, M. C. Cooperative and Competitive behavior of kibbutz and urban children in Isreal. Child Development, 1969, 40, 609-617.

Simon, J. & Feather, N. Causal attributions fo success and failure at university examinations. Journal of Educational Psychology, 1973, 64, 46-56.

Slavin, R. Classroom reward structure: an analytical and pratical review. Review of Educational Research, Fall 1977, 47(4), 633-650.

Slavin, R. Student teams and comparison among equals: effects on academic performance and student attitudes. Journal of Educational Psychology, 1978, 70(4), 532-538.

Snyder, C. R. Effects of comparison level feedback on classroom-related verbal learning performance. Journal of Educational Psychology, 1972, 63(5), 493-499.

Snyder, C. R. & Katahn, M. The relationship of state anxiety, feedback and ongoing self-reported affect to performance in complex verbal learning. The American Journal of Psychology, June 1970, 83(2), 237-247.

Stinson, M. Maternal reinforcement and help and the achievement motive in hearing and hearing-impaired children. Developmental Psychology, 1974, 10, 348-353.

Strang, L., et al. Social comparison, mulitiple reference groups and the self-concpts of academically handicapped children before and after mainstreaming. Journals of Educational Psychology, August 1978, 70(4), 487-497.

Uguroglu, Margret E. & Walberg, Herbert J. Motivation and Achievement: A Quantitive Synthesis. American Educational Research Journal,1979, 16, 375-389.

Veroff, J. Social comparison and the development of achievement motivation In C. P. Smith (Ed.), Achievement-related motives in children. New York: Russell Saga, 1969. Pp 46-101.

Walberg, H. J. & Vguroglu, M. E. Motivation and educational productivity: theories, results and implications. In Fyans, Jr. (Ed.). Achievement Motivation: Recent Trends in Theory and Research. New York: Plenum, 1979.

Weiner, B. Attribution theory , achievement, motivation and the educational process. Review of Educational Research, 1972, 42, 203-215 (a).

Weiner, B. A. A theory of motivation for some classroom experiences. Journal of Educational Psychology, 1979, 71, 3-25.

Weiner, B., & Peter, N. V. a cognitive-developmental analysis of achievement and moral judgements. Developmental Psychology, 1973, 9, 290-309.

Zajone, R. & Brickman, P. Expectancy and feedback as independant factors in task performance. Journal of Personality and Social Psychology, 1969, 11, 148-156.

SECTION II:

LEARNING AS A PROCESS

Discovery versus Expository Instructional Strategies and Their Implications for Instruction of Hearing-Impaired Post-Secondary Students

Rowland S. Blake

A Historical Perspective

"...to really possess knowledge or acquire an idea, the learner must discover by himself or through his own insight." (Quotation in Ausubel, 1978, p. 529)

This reflects the views of many eminent individuals who have argued for the virtues of "discovery learning." Discovery learning occurs when a person discovers a concept or principle among concrete phenomena or examples rather than being given a statement of that concept or principle. It focuses on the learner and the learning process, although exponents of this method have typically been educators encouraging teachers to promote discovery through their teaching. This method is thus not only a learning method, but an instructional one as well, since the teacher consciously withholds pertinent information to promote discovery by the learner, often providing certain cues or prompts to the learner in order to promote learning.

The discovery method has found proponents from very early times. In his dialogue with the slave boy, Socrates engaged in posing questions to the boy in order to help him discover certain principles of geometry.

Other prominent proponents of the discovery method have been Rousseau, Montessori, Dewey, and Bruner (Kornbau, 1977). Advocacy for the discovery method grew especially in the wake of the Progressive Education movement, which viewed traditional teaching as authoritarian and heavily abstract. At that time the common image of teaching tended to be that of the professor standing at the front of the class, dispensing truth in the form of factual information and generalities within the context of a lecture. In reaction to that perception of traditional methods, other approaches utilizing laboratory work, concrete experiences, and problem solving tasks were recommended. Focus was turned on children's individual needs and their capacity to discover things for themselves. This trend received an additional boost from the growing cry for increased scientific competence for American students in the post-Sputnik era. The scientific laboratory at schools and colleges grew in prominence and students were encouraged to engage in discovery experiences in order to be "scientific."

The most prominent advocate for discovery learning in recent times has been Jerome S. Bruner. He has done more to popularize discovery learning than probably any other educator. He argues persuasively for the benefits that discovery learning can give, advancing a number of arguments which tend to be philosophical, but which ultimately are subject to empirical verification.

Probably one of Bruner's greatest contributions has been to provoke overt experimentation in order to establish the validity of the discovery method. The decade of the 1960's saw a fair amount of experimentation, which lasted into the 1970's. In recent years, experimental interest in the topic has waned, probably due to the relative lack of conclusive research findings on the question. More recent research on the discovery method has shifted away from the question about the utility of the discovery method as a unified approach, and has centered more on establishing interactions--the various conditions under which the discovery method may be valuable, for example, for certain types of students, certain types of content, or certain types of learning tasks. Before examining such research studies and their results, let us first define as accurately as possible just what the discovery method is.

Discovery Method and Expository Method

In order to understand how the discovery and expository methods differ, it is first necessary to understand various categories of learning behavior and specifically, what a "rule" is.

Domains and Categories of Learning Behavior

In an effort to define different types of learning and to formulate learning and/or instructional strategies for each type or category of learning behavior, various educators have developed taxonomies of learning behaviors.

Bloom (1956) divides behaviors into the cognitive domain (intellectual processes), the psychomotor domain (motor skills), and the affective domain (attitudes and values). Each of the domains can be broken down further into types of learning. Here are some of the most prominent types found in the cognitive domain (adapted from Gagne, 1970, 1977):

Categories of Learning in the Cognitive Domain

Learning Category	Example
Memorized knowledge	Stating that Gutenberg was the first person to use movable type to print a book
Discrimination	Distinguishing printed b's from d's
Concept	Identifying a 747 as a jet aircraft
Rule	Calculating the square root of 3.14
Problem solving	Formulating a rule for predicting unemployment level from economic indices

We are most interested here with the last three types or categories.

A concept refers to a class of objects, things, or events which share certain attributes or characteristics. The verbal statement enumerating the attributes which define the concept is called a "definition," in the same sense as definitions found in the dictionary. The standard test of whether a person has mastered the concept is not whether he or she can state the definition or name of the concept, but whether he or she can identify examples belonging to the concept class. The student is shown something and must indicate "Yes, this is an example," or "No, this is not an example" of the concept.

A rule involves the interaction or manipulation of two or more concepts, e.g., calculating the volume of a sphere or making the noun of a certain class plural by adding the suffix s. Such an operation is often called a "rule" or "principle" in the literature. Sometimes the more lay term "procedure" is used. Applying the rule to a specific instance is often called "rule-using." An example showing how the rule is correctly applied, generally in a step-by-step manner, is called an "example" of the rule. A statement describing a rule, listing what must be done at every step of the manipulation, is called a "rule statement" or sometimes simply a "rule."

A concept is really a special type of rule. For a person to decide whether an instance is a member or example of the concept class, he or she must make sure that the instance exhibits the characteristics or attributes which define the concept. For example, to decide if a 747 is a jet aircraft, one must answer the questions, (a) Does it have airfoil-shaped wings?, (b) Does it fly?, and (c) Does it have jet engines for propulsion? If the answers are "yes," then one concludes that a 747 is a jet aircraft. This process of matching attributes of the instance and the definition is itself a procedure or rule, though it may often be executed in a split second. Applying such a matching rule results in a binary conclusion, "Yes, it is an example," or "No, it is not an example." Other than concept rules, most rules do not have a binary output, but can result in many possible outputs, depending upon the specific instance.

It is because a concept is a special kind of rule that the term "rule statement" (or "rule" for short) is used in conjunction with concepts as well as rules. In the research literature dealing with the discovery and expository methods of instruction the term "rule" generally is used to refer to the rule statement of either a concept or a rule. This usage will be followed in this paper, unless otherwise stated. When the designation "rule/principle" is used, it will refer specifically to a rule, not a concept.

Problem solving behavior is often regarded as the highest category of behavior in the cognitive domain. This refers to situations in which the student is required to solve a problem by selecting, combining, and/or generating rules and then applying the rules in such a way as to solve the problem. Problem solving behavior thus involves "rule-finding" and "rule-using" behavior. In order to qualify as problem solving behavior in the strictest sense of the term, the student must not have known one or more of the rules beforehand (although the teacher may know them). Thus, though we may speak of "practice exercises" or "problems" which the student must solve (e.g., mathematical problems), if the student knows the rule for solving the "problem," it is not really problem solving but rule-using behavior.

Expository Method

Since the discovery method arose in reaction to the then prevailing system of instruction, it may be useful to first define the principal characteristics of traditional expository instruction.

Admittedly, expository instruction may and can take many diverse forms, but one might characterize expository instruction, at least in context of this discussion of methods, as instruction in which the teacher supplies the student with all the necessary information or content that is to be learned. The emphasis is on the conveyance of relatively complete, well organized and defined content. Other terms that have been applied to this variety of instruction are "didactic," "deductive," and "teacher-centered" instruction.

Such instruction has typically provided the student with explicit statements of the concepts or principles to be learned (i.e., the "rules"). Definitions for concepts would be provided as well as procedures for performing a task or exercise. Students may, for example, be required to solve a set of algebraic formulas, but would first be given the rules by which such formulas could be solved. The usual sequence in expository instruction would be first, a presentation of the rule, then manipulation of examples. In instructional literature, this sequence is sometimes referred to as "ruleg." Teacher-presented examples may or may not be followed by practice exercises, examples that the student must manipulate, but such practice exercises are generally included in the more effective forms of expository instruction.

Discovery Method

Just as expository instruction can take many forms, the term "discovery method" has been applied to many different varieties of instruction. There has been a lack of agreement in the educational literature on the definition of discovery learning. Definitions tend to focus on the necessity of the student discovering what is to be learned, without being given the explicit information or content by the teacher. The student is seen as receiving little or no guidance while wrestling with the material and he or she must "go beyond the evidence" to discover something. Just what the student discovers depends upon the specific instructional or experimental situation, but frequently includes the underlying but unstated rule which is illustrated in examples presented to the student. In some cases, the student is actually required to formulate and state verbally the definition of the concept or statement of the principle, but regardless of whether that verbal formulation is required or not, the student must typically be able to apply the rule in new situations, e.g., by solving a similar mathematical problem, or by identifying a new example of the concept that was illustrated by the previously encountered examples.

Other terms have been used to refer to discovery learning, for example, "inductive" method, "heuristic" method, "activity learning," "guided discovery," "egrule" strategy, "learner-centered instruction," and even the term "problem-solving."

The term "inductive" method tends to be used by persons who have less familiarity with the theory and research literature of discovery learning, and is perhaps best to avoid because of additional meanings beyond the concept of discovery learning. The term "inductive" is used in philosophy to identify inductive logic as opposed to deductive logic. Even in philosophy inductive logic is nowhere near as well articulated or defined as deductive logic.

Some psychologists also use the term to refer to inductive processing, i.e., a mental process of arriving at conclusions from a restricted set of data. Although this meaning does have some relationship to discovery learning, it is clearly outside the domain of this paper to explore the mental processes of learners. Rather, the focus is on instructional strategies, what the teacher can do to facilitate learning by the student. In any case, it is difficult to accurately assess and describe and draw generalizations about the internal cognitive processing of individuals or groups. It is easier to describe the techniques that an instructor uses in an effort to get students to learn, and to assess the learning outcomes. Admittedly, Bruner was hopeful of focusing on learning processes rather than learning outcomes. He or other educators could, of course, posit all sorts of learning processes; but what can effectively be described is the set of teacher behaviors and the stimuli presented to the student (these are instructional variables) and the outcomes of instruction—what skills or knowledge the student is able to demonstrate. Research on the discovery method thus tends to focus on the instructional variables and the outcomes of instruction, rather than the process.

Another term used to refer to discovery learning is "egrule," an abbreviation for "example-rule." This simply means that learners are first given examples before formulating or seeing the rule statement. A sequence of rule, then examples would be termed "ruleg."

The term "problem-solving" is sometimes used synonymously with discovery learning. In one sense this is true, since the student is not shown the rule-statement but must discover it; the "problem" is to discover the rule. This type of problem solving, however, is not the usual kind of problem solving, which typically is more complex and requires the student to discover or find many different rules, often each of them known to the student in isolation, and combine them together in a strategy—a new rule--to solve the problem.

In "guided discovery" the learner is not provided certain information, but is guided by the instructor with hints, questions, or other devices to find the rule. In a "pure" discovery situation, no such help would be given.

In analyzing the senses in which the term discovery method is used and ways in which it is operationalized in research designs, it is possible to define discovery method in terms of two variables:

1. Amount of guidance
2. Sequence of rules and examples

In a pure discovery mode, the student is given no guidance from the teacher, but is expected to discover the underlying rule. In expository instruction the student is provided all of the context to be learned and considerable guidance, including, of course, the rule. In discovery learning, the amount of guidance may actually vary from none or a minimal amount to a substantial amount. Guidance can take many forms. Rule statements for the rules and concepts may in one sense be regarded as guidance to help the student master the rules and concepts. Other guidance may take the form of prompts or cues designed to help the learner focus on relevant stimuli and see certain inherent patterns. In some cases the patterns can be highlighted simply by the spacial relationship and placement of the information in the instructional materials. Guidance may also take the form of instructions or directions designed to help the learner approach the instructional task in a certain way. Objectives, advanced organizers, inserted questions, or a variety of other devices can also be given as guidance to help the student focus his or her attention on important information or skills. Feedback or praise or encouragement can also be regarded as forms of guidance.

The second variable which frequently characterizes the differences between expository and discovery instruction is the sequence in which critical information is given the student, specifically, the sequence of rules and examples. In expository instruction, the student is first given rules, then examples which illustrate the rule. After that, the student is generally given practice exercises in which he or she must use the rule in specific instances. In the discovery method, the student is first given examples and/or practice items which illustrate the rule, from which he or she must induce the rule. Upon formulating the proposed rule, the student would generally be given either feedback or the rule-statement to confirm the discovery.

Given all of the variables mentioned above, research on the discovery method is expectedly diverse. The practical effect of this is that the body of research tends to be somewhat inconclusive. However, a significant portion of the research includes the manipulation of rules and examples and their sequence, so that in this portion of the research literature it is more possible to reach some conclusions.

It is important to keep in mind that the discovery method has generally been addressed in the theoretical and research literature as an alternative to expository instruction, and therefore in opposition to it. The two varieties of instruction are thus treated as two polar concepts, and much of the research dealing with them compares the two. Much of the research appears to be motivated by a desire to substantiate the claims and superiority of the discovery method.

In actual instruction, and even in research design, it is sometimes somewhat difficult to distinguish the two approaches in a pure way. Much instruction is actually a combination of the two. For example, take the sequence of instruction, examples-rule-examples. The first part of this sequence, examples-rule, reflects the discovery method, whereas the latter part of the sequence, rule-examples, reflects the expository approach. Even in a discovery mode, once the student infers the rule, feedback or the actual rule is often given the student, after which the student is expected to apply the rule to new situations instances. At that point it is inaccurate, strictly speaking, to talk about a discovery mode, since the rule has already been discovered. If, moreover, the student is given no practice items for applying the rule, the instructionl sequence will probably be faulty and not result in student mastery of the rule, i.e., application of the rule.

Another reason pure polar types of instruction are not prevalent is because even in discovery learning there is a range in the amount of guidance a student can be given in his or her attempt to discover the rule. Many research designs have in fact included a "guided discovery" treatment, which shares some of the characteristics of expository instruction. One critic of discovery learning, Ausubel (1978), has even charged that guided discovery learning is simply a form of expository instruction. While being aware of this relative indeterminacy of boundary between discovery learning and expository instruction, it is still useful to look at the research comparing discovery and expository instruction. If there is to be any useful effect of discovery learning, it is most apt to be detected in experiments which distinguish the two approaches.

Rationale for the Discovery Method

Ausubel (1978) summarized the following arguments advanced in support of learning by discovery:

1. All real knowledge is self discovered.
2. Meaning is an exclusive product of creative, nonverbal discovery.

3. Sub-verbal awareness is the key to transfer.

4. The discovery method is the principal method for transmitting subject-matter content.

5. Problem-solving ability is the primary goal of education.

6. Training in the "heuristics of discovery" is more important than training in subject matter.

7. Every child should be a creative and critical thinker.

8. Expository teaching is "authoritarian."

9. Discovery organizes learning effectively for later use.

10. Discovery is a unique generator of motivation and self-confidence.

11. Discovery is a prime source of intrinsic motivation.

12. Discovery ensures "conservation of memory." (p. 520)

Ausubel argues that these claims for the benefits of discovery learning are untenable both logically and pedagogically (Ausubel, 1978, pp. 520, 529-553). Many of Ausubel's arguments are theoretical in nature, appealing to logic or educational philosphy to refute the claims. Some of his arguments seem to lose their power because he takes a rhetorical stance against overstated or exaggerated claims by advocates of discovery learning. However, in all fairness to Ausubel, the claims for discovery learning have often been couched in far more philosophical rhetoric without basing their claims on empirical evidence.

Many of these claims for discovery learning, of course, are basically philosophical. Arguments 5, 6, and 7, for example, reflect the value placed on each child becoming a critical and creative problem-solving individual. This view reflects a value orientation toward thinking, discovery and problem- solving. While Ausubel undertakes to refute the psychological and educational validity of such claims, claiming that the undue preoccupation or obsession with making the individual student a critical thinker ingnores the importance of teaching the student the body of knowledge of a particular subject matter.

Certain other claims for discovery learning which reflect a more empirically based position can be summarized in this manner:

1. Discovery learning results in better retention of information.
2. Discovery learning results in better transfer.
3. The use of the discovery method is intrinsically more motivating for learners than expository teaching.
4. Engaging in discovery enhances the student's problem-solving or discovery skills.

Hypothesis 4, cited directly above, while open to empirical verification, has not often been addressed in research. Some experiments which include transfer tasks are probably aiming at measuring this type of effect.

Research Findings

Research studies to compare the effects of the discovery method and expository instruction have in general been inconclusive. In their summary of a conference on discovery learning, Keislar and Shulman (1966) indicated one of the major problems contributing to the inconclusiveness of the research:

> Examination of both the exhaustive reviews of the literature and deliberations of the conference lead to an inescapable conclusion: The question as stated is not amenable to research solutions because the implied experimental treatment, the discovery method, is far too ambiguous and imprecise to be used meaningfully in an experimental investigation. (p. 191)

Disagreement about the meaning or implementation of a discovery approach is undoubtedly one of the major contributing factors to the inconclusiveness of the research. Thus, empirical studies, even when meticulously designed and conducted, have yielded results which are difficult to compare.

Other factors contribute to this state of affairs, however. Even when there is an experimental definition of the discovery method, there is often a poor research design, leading to lack of control of experimental variables, confounding of variables (two or more factors which may account for differences, but which are used in the same treatment, and whose effects cannot, consequently, be separated), or obscuring factors which are present in both experimental treatments, e.g., teacher's style.

Despite the difficulties, it is possible to draw at least some tentative conclusions about what the research indicates. There are some trends which point to certain advantages of one or the other method and may serve as the basis for further experimentation and/or the initial design of instructional strategies for an instructional system. Let us first look at research findings about main effects, ignoring the question about whether certain types of students or content or other factors modify the effect of the instructional method.

Effects of Discovery Method and Expository Method

There are two main dependent variables which have figured in research on discovery learning: immediate retention and transfer. In a few experiments delayed retention has been one of the dependent measures. Time spent in learning has been another fairly prominent dependent measure, while motivation or affect has been infrequently examined. Here is a summary of the findings of research on each of these variables:

Immediate Retention

Some studies show no significant differences between the discovery approach and the expository. Many studies actually show the expository approach to be superior. Taken as a whole, one could at least conclude that the expository approach tends to be superior to the discovery approach in terms of immediate retention. For advocates of discovery learning, this is obviously a disheartening conclusion.

Transfer

Here again, some studies show no significant differences between the discovery and expository approaches. However, in this area, research tends to favor the discovery approach as being more effective. This is certainly not entirely conclusive, but a fair possibility. Studies measuring the effect of the instructional method on transfer tend to be inconclusive because the studies do not always treat "transfer" tasks alike. Some studies use the application of a learned rule to new instances as the transfer task (rule-using); others use the discovery of a new rule from a set of examples as the transfer task.

Research findings on transfer effects tend to favor the initial experimental treatment most approximating the conditions of transfer. In cases where discovery of a new rule constitutes the transfer task, the initial discovery treatment tends to be more beneficial than an initial expository treatment; in cases where the transfer task requires the application of an already discovered or explicated rule, the expository treatment tends to produce better results on the transfer task. This strongly suggests that the nature of the transfer task should be strongly considered in deciding what the initial instructional treatment or method should be. Carefully articulated objectives should serve to specify transfer as well as immediate retention requirements.

In general, examination of the effects of discovery learning on transfer tasks yields the most promising results for the advocates of discovery learning. This finding has, in fact, emerged from early research literature and been incorporated into the hypotheses and experimental designs of subsequent research.

Time for Learning

Except for a few isolated experiments, the expository approach shows a clear and consistent advantage over the discovery approach in terms of time required for learning; students simply learn faster with the expository approach. This rather clear finding has led some experimenters to suggest that the real research question about the discovery approach is "not whether learning by discovery enhances learning, retention, and transferability, but whether: (1) it does so sufficiently, for learners who are capable of learning concepts and principles meaningfully without it, to warrant the vastly increased expenditure of time it requires; and (2) in view of this time-cost consideration, the discovery method is a feasible technique for transmitting the substantive content of an intellectual or scientific discipline" (Ausubel, 1978, p. 529).

Motivation or Affect

Very few studies address this dependent variable. Proponents of the discovery approach, of course, hypothesize greater motivation and interest for that method. However, because of the paucity of studies addressing this issue, and because the few existing studies do not adequately measure the variable, one cannot conclude that either method is superior on this variable.

Amount of Guidance

A number of studies compare the relative merit of discovery treatments which vary in the amount of guidance provided the student (an independent variable). In general, the "guided discovery" approaches result in better learning than discovery approaches with less guidance or no guidance. Thus, discovery approaches which resemble or approach expository instruction in terms of the degree of guidance tend to be more effective than discovery approaches with less or no guidance.

Verbalization of Rule

Hendrix (1947) hypothesized that the key to transfer is having a subverbal awareness of a rule and that verbalization of the rule is not only unnecessary for acquiring the rule, but is also harmful for the transfer of the rule. She conducted a study (Hendrix, 1947) which reportedly supported the hypothesis: discovery subjects who were not required to verbalize their generalizations retained their generalizations better (after about two weeks) than the discovery subjects who were required to verbalize the rule. However, Ausubel (1963) takes issue with her conclusions, pointing out that some aspects of measurement, evaluation, and controls reported in her study make her conclusions somewhat tenuous.

Schwartz (1948) suggested a refined form of the Hendrix hypothesis in a study he conducted: "A recently formed concept may be destroyed by the unsuccessful effort to verbalize it" (p. 63). Schwartz's experimental results did support his hypothesis: subjects who were able to orally verbalize the rule correctly were able to apply the rule in another situation, while of those who incorrectly verbalized the rule, most (but not all) were unable to apply the rule correctly in another situation.

Hanson (1967) found no significant differences in the effects of written verbalizations vs. no verbalizations for eighth graders and college students, although the analysis for college students alone favored the no verbalization group. It is significant to note that college students were drawn from an elementary mathematics course, while the eighth graders were drawn from a higher ability group. Ability to verbalize may, in fact, be a mediating factor in such experiments.

In an experiment by Retzer (1969), before subjects were given the experimental task, they completed a programmed unit involving the specification of domains and quantifiers and were thus prepared to give precise verbalizations. Retzer found no significant differences between treatments, and thus no support for the Hendrix hypothesis. An experiment by Sowder (1974) also yielded no support for the Hendrix hypothesis. A noteworthy difference between the Sowder study and the Hendrix study is that Hendrix required precise verbalization of the rule, while in the Sowder study, vernacular statements were accepted if not inaccurate.

Other experimenters (Guthrie, 1967; Kersh, 1962) obtained results that support the Hendrix hypothesis. However, in these experiments, students had to spend extra time learning the rule until it could be verbalized upon request.

While it is difficult to interpret with finality the diverse findings about the effects of verbalizations on subsequent applications of rules, it appears that students who are equipped to verbalize a rule, and who actually have attained an accurate perception of the rule, have no difficulty in further applying it. Students who have not gained an accurate perception of the rule, or are unable to verbalize it, seem to have difficulty in applying the rule later. This can possibly be explained by the concept of retroactive inhibition, i.e., that the involvement of a student in a particular task (verbalizing) interferes with the memory of an earlier task.

Ausubel (1978) suggests that "more probably these findings merely show that a relatively clear and consolidated subverbal insight is more functional and transferable than an ambiguous, inept, unconsolidated, and marginally competent verbally expressed idea" (p. 536). Ausubel cites studies which indicate that verbal insights are more transferable than subverbal insights (Spiker & Terrell, 1955; Weir & Stevenson, 1959) and studies showing that knowledge of underlying verbal principles enhances problem solving (Ewert & Lambert, 1932; Gagnier & Smith, 1962). He argues that the articulation of a rule and providing a label for the concept or rule helps the student to remember it and apply it in new situations.

Relationship of Instructional Methods and Learner Characteristics

As individual research studies have failed to yield definitive conclusions about the superiority of the discovery method of instruction over the expository, attention has been increasingly turned to seeking for interactions with various learner and content variables, in an attempt to ascertain what type of learners or what type of content are most beneficially taught by the discovery method or the expository method. First, interactions with learner variables will be discussed.

Mental Ability

Much research fails to establish that mental abilities or IQ affect students' performance under expository or discovery learning conditions. Many studies (Anastasiow, 1970; Barrish, 1970; Fowler, 1931; Krumboltz, 1965; Ray, 1961; Robertson, 1973) have found no significant interactions between IQ and method of instruction, discovery vs. expository. One study (Sobel, 1956) found that subjects with high IQ's showed superior learning results under the discovery method, as compared to the expository method. For subjects of lower IQ, there were no significant differences in performance between discovery and expository method treatments. Maynard and Strickland (1969) found similar significant benefits for high ability subjects, although the strength of the interactions was comparatively weak. Again, among low ability students, the expository method and discovery method yielded equivalent results.

Babikian (1971) found a three-way interaction between sex, IQ, and instructional method: high IQ boys performed better than high IQ girls under the discovery method, with high IQ girls doing no better under the discovery method than the expository. Nevertheless, high IQ boys still did not perform as well in the discovery treatment condition as in the expository. Babikian also reported that on a transfer test, high IQ subjects performed better having received the discovery approach than those having received the expository approach.

Field Dependence/Independence

Some researchers have investigated whether the instructional method--dis-covery or expository--interacts with field-dependence/independence. Field-independent individuals are characterized as being analytical and able to abstract relevant stimuli or attributes from a field of stimuli. Field-dependent individuals tend to approach a situation in a more global fashion and are less able to extract particular stimuli or attributes analytically; their strength is to apprehend the whole situation in an integrated way and also to be more sensitive to people and social situations.

Some researchers have posited that the expository approach is better for field-dependent students, since it provides a more analytical treatment of the learning task rather than requiring students to analyze it. Likewise, field-independent learners are posited to perform better under the discovery approach to learning, since they are able to analyze the learning situation and perhaps even need that challenge.

Of two studies examining this hypothesis, one of them (Douglass & Kahle, 1977) failed to find evidence for the interaction, while the other (McLeod, 1977) did find evidence that field-independent students learned better with the discovery approach and field-dependent students better with the expository approach. However, in the latter study the treatment variables were confounded, the expository group seeing examples in symbolic representation and the discovery group seeing examples in concrete, manipulable form. It is, therefore, impossible to draw conclusions about the interaction of instructional methods and field-dependence/independence.

Aptitudes and Interests

One study (Tallmadge & Shearer, 1969) examined the relationship between what they called "learning styles," instructional methods (discovery vs expository) and the type of learning task or content. To measure "learning style," the experimenters administered a battery of aptitude and interest tests to their subjects, e.g., tests of arithmetic, mechanical, clerical, verbal, logical reasoning, etc.; the Kuder Vocational Preference battery of tests (mechanical, computational, scientific, artistic, literary, social service, etc.); and a variety of other aptitude measures. The experimenters found no significant interaction between the instructional method (discovery vs. expository) and learner aptitudes and interests.

Creativity

One experimenter (Barrish, 1970) administered Torrance's Test of Creative Thinking ("divergent thinking") in an experiment to test the hypothesis that high divergent (creative) subjects would learn better using the guided discovery method, while low divergent subjects would learn better under the expository method. The research study failed to support the hypothesis. At this point, therefore, research is inconclusive in establishing a relationship between creative thinking and instructional method, discovery vs. expository instruction.

Age

In an analysis of various experiments on discovery/expository instruction, Hermann (1969) tried to determine whether the age of learners is a significant factor affecting whether the discovery or the expository method is superior. Hermann indicates that it is difficult to draw any definitive conclusions because of the incomparability of the experimental tasks from elementary school to high school to college, and because of the small number of studies dealing with elementary school children, namely two.

Anxiety

Research by Tallmadge and Shearer (1971) yielded a significant interaction between student anxiety and the method of instruction: low anxiety students learned better under the expository method of instruction, while high anxiety students performed better under the discovery method. While such an interaction is not explicitly examined in other studies, Cronbach and Snow (1969) indicated that they had found repeated hints in the literature about an interaction between anxiety and instructional treatment variables (cited in Tallmadge & Shearer, 1971). It is difficult to interpret exactly what this generalization might mean.

Relationship of Instructional Methods and Content Characteristics

There are a number of ways in which the instructional method may interact with the content. These are each discussed here.

Difficulty of Learning Task

An experiment by Danner (1974) attempted to examine the relative effects of the discovery and expository methods by giving students two different lessons. The study found no significant differences on these treatments, the main effects, but post hoc analysis indicated that one of the lessons was more difficult than the other. A further analysis of the data indicated that the expository method was more beneficial for the lesson of relatively high difficulty, while the discovery method was more beneficial for the moderately difficult lesson. The experimenter reasoned that "it seems logical that the two methods might interact with level of difficulty since they differ primarily in the amount of direction given and the amount of direction needed by a learner would vary with the level of difficulty of the task" (Danner, 1974, p. 83).

Mechner, on the other hand, takes a different position on this question in his review of programmed instruction: "If the concept is difficult for most members of the target population, EGRULE is more appropriate. If the concept is easy for most members of the target population, then the RULEG sequence is more appropriate" (Mechner, 1967, p. 97; quoted in Hermann, 1969, p. 64). It is not clear to what extent Mechner's conclusion is based on empirical evidence.

An analysis of the results of Danner's study (1974) and of studies on language teaching (to be cited later) suggests the following reasoning. If the learning task is difficult and it would be difficult for the student to discover the rule, and if the statement of the rule is sufficiently understandable, then the introduction of the rule should benefit the student in mastering the task, and the expository approach, which starts out with the rule, should be relatively more effective than the discovery method. If the learning task is relatively hard, as is the case above, but the statement of the rule is also difficult to understand, then introducing the rule may provide little positive benefit to the student in bringing order to the examples, and the student would do as well or better simply having the examples rather than a difficult, confusing rule: in this case the discovery approach would probably be more beneficial than the expository approach.

Difficulty of Transfer Task

A number of studies suggest that as the transfer task becomes more complex, the discovery method gains relatively more effectiveness over the expository method for preparing the student for the transfer task (Hermann, 1969, p. 61). In a study by Scandura (1964), discovery and expository groups of students scored equally well on "routine" transfer problems, but discovery group students scored significantly better on "novel" transfer problems. In another study Scandura found that the performance of the expository group of students on transfer tasks was disrupted to a much greater degree than the discovery group students when the transfer task became more complex. He used the term "complexity" to refer to "the attention to detail required to solve a problem" and the term "novelty" as "the degree to which the R-algorithm had to be modified" (Scandura, 1964, page 156; quoted in Hermann, 1969, page 61).

This suggests that the underlying variable is not "complexity" per se, rather, the degree of similarity between the transfer problem and the original learning task. A number of investigators have, in fact, found this to be true: in cases where the transfer task is similar to the original learning task, the expository method results in better transfer, while in cases where the transfer task is dissimilar to the original learning task, use of the discovery method on the initial learning task results in better performance on the transfer task (Breauz, 1975; Guthrie, 1967; Kersch & Wittrock, 1967; Pease, 1975; Singer, 1977). Breauz (1975) found, for example, that where the transfer task is rule-using, rather than rule-finding or rule formulation, then the discovery approach inhibits performance. That means that if the transfer task is not a discovery task, then the discovery method on the initial task is not desirable; if the transfer task requires applying the rule initially learned, then the expository approach is better. In examining the effect upon transfer of a "guided" vs. discovery strategy for psychomotor tasks, Pease (1975) discovered that the most effective transfer occurred when the condition of testing on the transfer task was similar to the initial learning strategy, i.e., when subjects receiving the discovery method initially used the discovery method on the transfer task, or initially "guided" subjects received a "guided" transfer task.

These results have great implications in interpreting the designs and results of earlier experiments examining the transfer of skills under discovery and guided learning conditions. In most of the previous studies concerned with transfer, transfer tasks have been administered under the condition of discovery, and thus discovery treatment subjects have generally had an advantage in the transfer task. This raises serious doubts about whether the transfer effects of the discovery method are really greater than for the expository method.

In the Pease (1975) experiment, incidentally, there were two transfer tasks, one of which was judged to be more complex than the other. The results did not indicate that the complexity of the task played a role or interacted with the learning method. Thus, the critical variable is not the complexity of the transfer task, but rather the similarity of the transfer task to the initial learning task.

The real instructional question, then, is "Under what conditions and in what type of transfer task does the instructor want the student to engage?" This should strongly suggest what type of instructional method--expository or discovery--should be used in earlier instruction. If the student is expected to apply rules to new situations, it is likely that the expository approach which teaches those rules would yield better results. If the student is expected to find new rules or engage in problem solving, then this should be facilitated by providing the student with early exposure to the discovery method. This is, in fact, precisely what some advocates of the discovery approach have purported, though not explicitly tested. Kersch and Wittrock (1967) concluded that the merits of a discovery approach for an expository ("directed") approach accrue from what the method requires of students: the discovery method helps students acquire facility in problem solving through the discovery (problem solving) approach, while the expository method helps students apply rules to new situations by giving them practice in applying rules.

The fact that research should bear out this contention represents one of the strongest pieces of evidence for the importance of practice, that a student should engage in practicing the type of skill he or she is expected to perform at a later time. This principle, it would appear, is of profound importance and ultimately is expected to have greater consequence than whether the expository or the discovery approach to instruction is used. If either an expository or discovery strategy fails to give the student practice in performing the required skills, or severely restricts the practice required of the student, then the student's performance in the immediate task or the transfer task is bound to be severely retarded. It also means that experiments which have restricted student practice and manipulation of examples--and this would more typically be the case with the expository treatment--then that experiment is defective and not an adequate test of the relative merits of the discovery and expository approach.

The importance of practice is further emphasized by the experimental results of Chambers (1971). He concluded that "over-learning ,i.e., practicing to mastery and beyond, has a considerably more powerful effect on transfer than does discovery. Over-learning also seems to be an important condition for transfer of a discovered principle--not because the principle is apt to be discovered during over-learning but because a certain amount of practice is necessary to make the discovered principle available for transfer" (pp. 57-58).

Previous Knowledge

Egan and Greeno (1973) conducted a study examining the performance of students under discovery and rule-using (expository) conditions and tried to analyze that performance in terms of component skills. They found that students without mastery of the component skills had more difficulty with the discovery approach, while the rule-using method was effective even with students not having the component skills. In this sense, a rule-using (expository) method compensated for student "deficiencies."

Alterman (1958) found that the inductive method produced significantly better results than the expository method on the transfer test only with students rating low on preliminary background tests, and only on the transfer test. This is consistent with expectations, since in that case students with little background would be having to discover new principles in new material. Students demonstrating a higher level of background knowledge performed better on the initial learning task test and the transfer test after receiving the expository instruction. One could conclude that for students with limited background knowledge or skills, the expository method results in better learning than the discovery approach, unless the objective is to prepare them for later skill in discovery tasks.

Category of Learning in Cognitive Domain

Most of the experiments comparing expository and discovery learning use experimental tasks that are concepts or rules/principles. At this point, it is not possible to draw generalizations about interactions between the category of learning in the cognitive domain and the instructional method, i.e., whether the expository or the discovery method is more effective with one or the other of the learning categories-concepts or rules/principles.

The problem-solving category by definition deals with situations where rules are not articulated or known; hence, problem-solving tasks must be approached by "discovery" methods. To the extent that such problem-solving tasks can be attacked by rules or heuristics, they become rule-using tasks and can be subject to discovery or expository teaching methods.

It has already been noted that if the transfer task is a problem-solving task, then the favored method on the initial task seems to be the discovery method.

Memorization tasks do not involve rules or generalizations and therefore are not ordinarily subject to the discovery vs. expository method issue. It is possible, however, to isolate items to be memorized in order to facilitate their memorization, e.g., with the use of objectives, glossaries, italics and other prompts, or through arranging them in patterns which may serve as a help in their memorization. Inasmuch as these devices may be regarded as forms of "guidance," the issue of discovery vs. expository methods may have some implications. Such devices have not been examined in conjunction with memorization tasks in the literature on discovery vs. expository teaching methods, however, and therefore no conclusions can be drawn in this regard.

Domains of Learning

Most of the research on discovery vs. expository methods has been done in the cognitive domain, as already mentioned. A study by Singer and Pease (1979) did use a psychomotor task in their investigation of expository vs. discovery instruction. They used three treatments--a discovery instructional strategy, a "guided" (prompted) instructional strategy (i.e., a "expository" instructional strategy), and a combination instructional strategy (first with prompts and then without). The task was to execute a sequence of hand/foot manipulations of handles and peddles in a pre-determined sequence. The guided learning and combination learning subjects performed better in learning the initial task, but the discovery learning subjects performed better on the one-day delayed retention test. On a transfer task, the discovery learning and combination method subjects performed the best.

Such experimental results are consistent with other research using cognitive tasks. Examination of the experimental treatments suggests, in fact, that the cognitive component of the tasks was more important than the psychomotor component. In an earlier study by Pease (1975), the experimenter does, in fact, admit that the "experimental tasks used in this study certainly involve extensive cognitive effort in the learning of the sequence along with the development of motor skills to manipulate the components" (p. 86). It is worthy of note, however, that the corresponding cognitive task was not a concept or rule/principle, but a serial memorization task--memorizing an invariant sequence of responses.

In Pease's earlier study (1975), the discovery method did not necessarily result in more efficient transfer, contrary to expectations. Rather, transfer was greatest when the testing method of the transfer task was similar to the method of learning in the initial sequence.

In an article by Singer (1977), the author reviews the literature on errorless vs. trial and error learning in the psychomotor domain. He speaks of "trial and error" learning as "discovery learning" and errorless learning as "prompted" or "guided" learning (which is analogous to expository instruction). His review led him to suggest that the instructional strategy be chosen according to the purpose underlying the instruction: a prompted method should be followed if the purpose is to achieve a high level of skill in the learning task (as opposed to a transfer task) or if the eventual performance will be executed in the presence of prompts. If transfer tc other skills must take place, then a discovery approach would be better followed.

Content Areas

An attempt was made to determine whether the discovery or the expository method is of special benefit in particular subject matters. That is a difficult thing to do, first of all, because it's often difficult to determine the actual nature of the experimental material from the written reports of experiments. Written reports indicate that a significant portion of experimental materials is drawn from the content area of mathematics. Some of these tasks deal with number series which reflect certain systematic arrangements. Other materials to be found in experiments are arrangements or groups of words which express certain relationships, e.g., opposites. Some experiments use coding exercises, requiring the student to decipher cryptograms; these are generated by taking words and scrambling the letters according to various systematic rules and/or substituting letters systematically for other letters.

Most of these types of experimental materials--number series, word relationships, and coding exercises--involve the manipulation of numerical or linguistic symbols, but at a rather rudimentary level. Some of the mathematical tasks are of a higher level, requiring the calculation of products or sums. Other material is clearly drawn from technical fields, e.g., a task involving orthographic projection and a task involving the reading of calipers, a measuring instrument (see Hermann, 1969, for oblique references to content areas.)

The few psychomotor tasks used in experiments involve a fixed sequence of pressing and manipulating various handles, pedals, and other controls by hand and feet.

It is difficult to conclude in what content areas the above experimental tasks can be generalized. However, it is safe to assume that they would have more relevance in the technical and communication fields, rather than in the personal-social area. A review of existing studies on discovery vs. expository teaching methods does not reveal any studies dealing with social content.

There are a limited number of articles which deal specifically with language teaching. These will be considered here.

Language Teaching

Language teachers have for a long time debated the merits of different teaching strategies, including deductive and inductive approaches (Fischer, 1979; Hammerly, 1975). In the late nineteenth century, there was a reaction against the grammar-translation approach, giving rise to the inductive "direct method." While there are some educators who took a more moderate or eclectic approach, advocates tended to be quite polarized into two extreme positions--the one emphasizing the recitation of grammatical rules and explanations, and the other the repeated use of concrete grammatical utterances. The polarization was enhanced by Carroll's dichotomy between the "audio-lingual habit formation theory" and the "cognitive code learning theory" (Hammerly, 1975, p. 16). The "cognitive approach" was simply another name to describe in more modern terms the deductive, traditional method. While Carroll's distinction was probably too polarizing (and he later backed off of such a strong distinction), it did serve to cast in more modern terms an old controversy.

Chastain (1976) carried the distinction one step further, stating that some foreign language educators "feel the basic elements of the audio-lingual and cognitive theories condense to the difference between inductive and deductive learning" (p. 236). Hammerly (1975) feels that Carroll's dichotomy is frankly completely unnecessary, since it is possible to have audio-lingual habit formation with deduction and cognition. For example, Hammerly indicates that:

> A grammatical point can be introduced by means of contrastive examples (calling for cognition on the part of the students), followed by an explanation or generalization (ideally provided by the students themselves, but in any case involving also cognition), followed by intensive habit-forming, choice-making exercises in the performance of which the students apply the rule deductively; however, as these exercises continue and are speeded up, the rule can be gradually phased out from the

students' attention, to be replaced by increasingly automatic responses to structural cues. (p. 16)

This description of a language teaching strategy is consistent with deductive/ inductive strategies used in other content areas: the deductive or expository method starting with a rule and continuing with examples, and the inductive or discovery strategy starting with examples, followed by a rule or rules. Hammerly is also quite right in indicating that some strategies have elements of both inductive and deductive methodology, when, for example, initial examples are followed by a rule, followed by additional examples or practice. In other ways, however, the characterization of the inductive approach in language learning departs from the traditional educational definition of inductive or discovery learning. In other content areas, the discovery approach starts with examples but includes a statement of the rule, even if discovered by the students and confirmed by the teacher; in the language literature, the "inductive approach" often is used to refer to a strategy involving only the use of examples, with no explicit reference to the rule. In this sense, it is an incomplete inductive or discovery strategy, but one that is undeniably followed.

A study by Rizzuto (1970) compared the effects of using an inductive and a deductive method for teaching rules of language structure. He used rules of morphology (the structure or composition of words) and syntax (the structure or word order of sentences). His research led him to conclude that the inductive method is superior to the deductive in the teaching of morphological and syntactic rules, measured either by a test on the immediate learning task or a transfer measure. He reasoned that it is logical to expect such results for the transfer test, since transfer tasks are generally inductive in nature in the sense that the rules are unknown.

Beyond that study, however, we are left to theorize under what conditions the inductive or the deductive approach is most beneficial in language teaching. Hammerly (1975) argues that:

> There is a middle ground in the deduction/induction controversy. This is to present inductively those grammatical points that the students can learn without an overt rule and deductively with rules, those grammatical points that require such an approach... The grammatical points that benefit from a deductive approach are generally points based on concepts lacking in the native language. (p. 18)

Fischer (1979) suggests this criterion: if the foreign language rule is (a) similar to the native language rule, or (b) dissimilar, but simpler than the native language rule, then an inductive approach would be better; if the foreign language rule is (c) dissimilar and as complex or more complex than the native language rule, then a deductive approach using the rule and making no reference to the native language structure should be used. In formulating such a proposal, Fischer draws upon formulations by Jakobovitz, who designed a transfer model on the basis of the degree of inter-language similarity. Jakobovitz deduced from his model that when two languages are highly similar, the most effective teaching strategy should make use of the student's knowledge of his native language, whereas when the two languages are unrelated, the teaching strategy should ignore the student's knowledge of his native language. This view has some of its roots in the "contrastive analysis" literature, which seeks to identify areas of similarity or difference between a native and foreign language.

At this point, it appears that there are few if any research studies which attempt to establish this proposal. It is not possible to tell from the report of the Rizzuto (1970) study whether the morphological and syntactic structures were relatively similar or dissimilar to the native language of the subjects.

Fischer's proposal is consistent with the findings of other studies about the inductive/deductive strategy variable. The complexity of the learning task has been found to influence whether a deductive or inductive strategy is more desirable: more complex material is in general better taught with the deductive or expository approach. Another pertinent variable, the similarity of the foreign language to the native language, is analogous to the issue of how much background knowledge or skills the student has before commencing on an experimental learning task. If the student's background is limited or incomplete, then in general the expository approach gives better results. One could argue that initial learning tasks then represent either more complex material or more dissimilar material to what the student already knows.

There are other factors which may affect whether the use of a language rule helps a student learn foreign language structures. If a rule is represented in notation which is unfamiliar to the student, as linguistic rules frequently are, then it may not serve to enlighten the student but to confuse. Even if the rule is parsimonious and accounts for a large corpus of linguistic phenomena, it may be too abstract from the student's viewpoint to be helpful. Another difficulty with some linguistic rules is that they apply to a relatively restrictive set of phenomena or may reflect a generality which has a notable number of exceptions. In such cases, students may find it easier to acquire new structures or patterns through direct exposure to specific instances without being exposed to the rule-statement.

This may also be said for rules in other content areas. If a mathematics rule or physics rule or graphics art design rule is represented in notation or words which are unfamiliar to the student, then the rule-statement is unlikely to help the student understand and apply the rule, but may actually confuse the student. Certainly, if a definition includes terms unknown to a person, then the definition cannot be understood without further elaboration or reference to the meanings or definitions of the component terms. Naturally, the use of examples is one way to overcome this problem, _if_ the examples are intelligible to the person.

Career Education

There seem to be no studies pertaining to which method--the discovery or expository method--is better for orienting students to careers and helping them to make career decisions. We are left to extrapolate from other studies under which conditions one or the other method is most beneficial.

Implications and Recommendations for Career Education at NTID

In designing a foundations program, certain decisions need to be made about the curriculum and about instruction. Most of the implications of discovery/expository research deal with the issues of instruction (e.g., instructional strategies), though some have an impact on the curriculum level.

In designing instruction, there are some things we know from research and other things we don't know. We are left to infer, not only from research findings, but from research "trends," instructional theory, logic and experience what approaches may be effective or optimal. We need to make the best informed decisions we can, recognizing that we don't know everything. We need to rely on ongoing evaluation to test and refine the approaches we take. This is a critical recommendation suggested by a thorough review of the literature.

The discovery/expository literature gives some direction for designing instruction, but its conclusions are not definitive. Consistent trends may still be useful to point a direction, however. The following sections will make recommendations for the "best anticipated approach" to instruction. They will go beyond the research data and reflect the reviewer's knowledge of other instructional research and theory. The rationale and source of the recommendations may be found in the preceding sections of this paper. When that is not the case, additional references will be provided.

General Recommendations

1. Do not restrict your teaching approach to either of the "pure" methods, either expository or discovery. Both may be used to advantage, each in different situations. It must also be remembered that few approaches are "pure," but may share characteristics of other methods. Needless to say, it would be a grave mistake to adopt wholesale a discovery approach to instruction, despite the glowing arguments and rationale used to support such a method. Empirical research literature simply does not justify such an adoption.

2. In general, use the expository approach in instruction to promote initial learning and retention. This will result in effective learning in the most efficient time.

3. In general, use the discovery approach when it is important for the student to engage in discovery or problem solving behavior in later, unique transfer situations.

4. In general, give the student as much guidance as needed, e.g., prompts, cues, feedback, praise, etc. Decrease or fade out the guidance as the student increases in proficiency.

5. Design instruction to allow for varying degrees of guidance, depending on the student's knowledge, skills and abilities. Build in some evaluation mechanisms for determining the degree of guidance the student wants or needs.

6. Provide students with opportunities to explore different career options and "discover" how their interests and skills match the career requirements. Some of these opportunities can be structured activities; others must be less analytically structured because of the need for students to "feel" what a particular vocation is like, and whether they like it. In any case, the student/career match cannot be thoroughly dissected analytically, since there are a lot of undefined intangibles which can best be experienced directly.

This is not to suggest that career decision making cannot or should not make use of analytical processes to systematically focus on certain variables that need to be considered in making a career decision, nor to suggest that efforts to formulate a systematic approach to career decision making are in vain. To the extent that factors and procedures can be defined and communicated to the student, they can be used to advantage. But it would be a mistake not to provide some opportunities for students to "discover" in more concrete, real or simulated situations, what they as individuals are like and how they feel about particular career options.

Specific Recommendations

These recommendations will specify under what conditions each of the methods--expository and discovery--are expected to give better results.

Expository Method

7. Use the expository approach for concept and rule-using tasks where the rule is definable and the rule can be understood by the student (with examples). One of the critical factors here is whether the rule can be understood by the student. That means that rules should not be so abstract that the student is not familiar with the component concepts, words, or symbols used in the formulation of the rule, or else the rules will cease to have meaning for the student. In some cases, the rule can be made more intelligible by providing definitions of component terms or concepts in words and concepts more intelligible to the student, or by suggesting that the rule is similar or analogous to another rule already understood by the student, or, most commonly, by providing examples which illustrate the rule.

8. Use the expository approach for problem solving tasks where there is a heuristic (an incomplete rule or "rule of thumb") which is definable and can be understood by the student, unless it is judged critical for the student to demonstrate problem solving behavior.

9. In memory level tasks, use whatever mechanisms are necessary or useful to isolate or focus attention on the items to be memorized, rather than letting the student "discover" them. Such mechanisms or devices might include such things as arrows, color high-lighting, lists or glossaries, italics or underlining, objectives, sample test items or study questions, and/or advanced organizers.

10. Use the expository approach for psychomotor tasks where the rule is definable and the rule can be understood by the student (with examples or demonstration).

11. Use the expository approach especially when the efficiency of instruction, i.e., time, is important.

12. Use the expository approach especially on content which is difficult or complex for the student.

13. Use the expository approach particularly in cases where students' prerequisite knowledge and skills are incomplete or faulty. It is important in this case, however, to assure that prerequisite knowledge and skills are described and available to the student.

14. Use the expository approach in conjunction with a discovery approach to provide more examples and practice after a rule has been discovered.

Discovery Method

15. Use the guided discovery approach for tasks for which (a) the rule is not definable or defined or (b) the rule is definable but not easily understood by the student. Such cases may arise where the rule is stated in such abstract or complex terms as to not easily be understood, or is stated in terms of other concepts or words or symbols with which the student is not familiar.

Many linguistic rules may fit into this category, as well as many of the personal/social skills, since the rules governing these skills may either not be definable or, if defined, not very intelligible to the student.

It should be noted that the discovery approach generally provides for the confirmation or statement of the rule once the student has encountered many examples and tried to discover the rule. However, it still may be advisable not to provide the rule to the student if it would not be easily understood.

16. Use the discovery approach when problem-solving behavior in new transfer situations is important for the student to have. This refers to situations in which rules must be selected or found (rule-finding), combined into new rules, and applied to the solution; this does not mean situations where old, known rules must be applied to new situations or instances (rule using). What this in effect means is this: the student who is required to solve problems should be given practice in solving problems; practice is the critical variable.

Besides being given practice in applying rules (rule-using), the student should also be given practice in rule selection (rule-finding) to facilitate problem solving. Instruction and practice in this important skill of rule selection is frequently overlooked. The instructor should make a conscious effort to formulate and articulate a rule or procedure for selecting other rules, including decision points, criteria, and branching logic governing the selection.

17. Use the discovery approach after the student has mastered the defined domain of competencies, when practice in transferring the skills to new situations is desirable. This is simply another way of emphasizing the need for students to acquire problem-solving skills. In sequence of time, this opportunity would probably be provided relatively late in a unit, course, or curriculum.

18. Use the discovery approach to help students gain a "feeling" for career areas, and an awareness and understanding of themselves—likes and dislikes, abilities and limitations, etc. These are factors which are often not definable by the teacher, counselor or student. In any case, give students concrete experience with a proposed

career or major area in order to refine their choices. This will probably come relatively late in the foundations program, after career choices have been tentatively made in as analytical a manner as is possible. The important factor here is not really whether a discovery or expository approach is used, but whether students are exposed to actual "examples" of the concepts inherent in a career decision.

Additional Critical Recommendations

It is important in implementing the preceding recommendations to pay attention to several other related variables which are extremely critical. These will be discussed here.

19. Make a conscious effort to integrate new material with old material already acquired by the student. Both the teacher and the student need to make a conscious effort to make this integration. This is one of the most critically important factors which needs to be accomplished in instruction. It not only makes learning more "meaningful" but it is a key mechanism by which new information is encoded into memory, i.e., "learned." This means that both rules and examples which incorporate elements already familiar to the student may have a positive facilitating effect on learning, while rules or examples which are not intelligible to the student have a disruptive effect. Other devices besides rules and examples may, of course, be utilized, e.g., analogies, heuristics, elaborations, and numerous other devices.

20. Use examples to illustrate concepts and rules. Examples should be used for either the expository or the discovery approach. Whether or not they are used probably impacts on the effectiveness of the instruction more powerfully than whether the expository or discovery approach is used.

21. Require students to practice manipulating the concepts or rules they are being taught. Much instruction is highly defective because of omitting this important component of instruction. The inclusion of practice is probably more powerful than whether the expository or discovery approach is used.

22. Consider carefully the importance of time in designing an instructional program. Efficiency is often a goal of an instructional design, i.e., how a student can learn the most in the shortest period of time. However, some studies indicate a correlation between the time expended in instruction or study and the amount learned (Stallings, 1980). This suggests one goal (a competing goal) of an instructional system is to have the student spend more time on the learning task, not less.

Making a conscious effort to integrate new material with old may take more time than learning something in a rote way. This suggests being careful not to compress learning time unduly, but allowing enough.

23. Use prompts and cues judiciously. The literature on prompts and cues--visual or verbal mechanisms to draw attention to relevant stimuli or expected responses--indicates the value of them in guiding a student to acquire a concept or rule. The research literature also demonstrates the value of fading them (dropping them out gradually) over time as the student progresses from an initial contact with the material toward mastery. This means that students should gradually receive less guidance as they progress through an instructional sequence. This might mean shifting from an expository to a discovery or problem solving approach as they progress through a unit, course, or curriculum.

References

Anastasiow, N., Sibley, S., Leonhardt, T., & Borich, G. A comparison of guided discovery, discovery, and didactic teaching of math to kindergarten poverty children. American Educational Research Journal, 7(4), 493-510, Nov., 1970.

Anthony, W. S. Learning to discover rules by discovery. Journal of Educational Psychology, 1973, 64(3), 325-328.

Beeker, J., & Young, C., Jr. Designing instructional methods in mathematics to accommodate different patterns of aptitude. Journal for Research in Mathematics Education, 1978, 9(1), 4-19.

Blake, K. A., Ainsworth, S. H., & Williams, C. L. Effects of induction and deduction on deaf and hearing individuals' attainment of first-order concepts. American Annals of the Deaf, 1967, 112, 606-613.

Boutwell, R. C., & Barton, G. E. Toward an adaptive learner-controlled model of instruction: A place for the new cognitive aptitudes. Educational Technology, 1974, 5(14), 13-18.

Breaux, R. Effects of induction vs. deduction and discovery vs. utilization on transfer of information. Journal of Educational Psychology, 1975, 67(6), 828-832.

Bruner, J. S. The Relevance of Education. New York: W. W. Norton & Co., Inc., 1971.

Chambers, D. W. Putting down the discovery learning hypothesis. Educational Technology, March 1971, 54-59.

Collinge, J. The teacher's role in discovery learning. Reading Improvement, 1975, 3(2), 92-95.

Craig, R. Directed versus independent discovery of established relations. The Journal of Education Psychology, 1956, 47, 223-234.

Craig, R. Recent research on discovery. Educational Leadership, Feb. 1969, 26, 501-505.

Cronbach, L. J., & Snow, R. E. Aptitudes and instructional methods: A handbook for research of interactions. NY: Irvington Publishers, 1977, 311-320.

Danner, D. W. Effects of discovery and expository teaching methods in locus of control on retention and transfer. (Doctoral dissertation, Temple University) Ann Arbor, Mich.: University Microfilms, 1974, No. 7419746.

Douglass, C. B., & Kahle, J. B. The effect of differentially sequenced individualized instructional materials on student achievement in biology. Journal of Research in Science Teaching, 1977, 14(4), 335-340.

Egan, D. E., & Greeno, J. G. Acquiring cognitive structure by discovery and rule learning. Journal of Educational Psychology, 1973, 64(1), 85-97.

Fischer, R. A. The inductive-deductive controversy revisited. Modern Language Journal, 1979, 63(3), 98-105.

Gagne, R. M. Is educational technology in phase? Educational Technology, 1980, 20(2), 7-14.

Gagne, R. M. (Ed.). Learning and individual differences. Columbus, Ohio: Charles E. Merrill Books, Inc., 1967, 1-45.

Gordon, J. R. An instrument to measure discovery and expository presentations. Paper presented at the Annual Meeting of the American Educational Research Association, San Francisco, April 1979; ED 169118.

Guthrie, J. T. Expository instruction vs. a discovery method. *Journal of Educational Psychology*, 1967, *58*(1), 45-49.

Hammerly, H. The deduction/induction controversy. *Modern Language Journal*. 1975, *59*(1), 15-18.

Hardie, C. D. Inductive learning. *Educational Theory*. 1975, *25*(1), 40-44.

Hendrix, G. A new clue to transfer of training. *Elementary School Journal*. 1947, *48*(1), 197-208.

Hermann, G. D. Egrule vs. ruleg teaching methods: grades, intelligence, and category of learning. *The Journal of Experimental Education*, 1971, *30*(3), 22-33.

Hermann, G. D., & Hincksman. Inductive vs. inductive approaches in teaching a lesson in chemistry. *Journal of Research in Science Teaching*, 1978, *15*(1), 37-42.

Hermann, G. D. Learning by discovery: A critical review of studies. *The Journal of Experimental Education*, 1969, *38*(1), 58-72.

Hirsch, C. R. The effects of guided discovery and individualized instructional packages on initial learning, transfer, and retention in second- year algebra. *Journal for Research in Mathematics Education*, 1977, *8*(5), 359-368.

Hirshfeld, S. F. *An examination of methodological problems in a laboratory comparison of learning by discovery and expository treatment*. (Doctoral dissertation, University of Minnesota) Ann Arbor, Mich.: University Microfilms, 1974, No. 752106.

Hoagland, C. W. *The selection process: The first step of teaching by the inquiry methodology*. (Doctoral dissertation, University of Massachusetts) Ann Arbor, Mich.: University Microfilms, 1973, No. 7314647.

Hosen, R. Effective instruction in principles of economics. The Journal of Economic Education, 1976, 7(2), 125-126.

Hurst, J. B. Discovery teaching and increased student motivation. Toledo, Ohio: University of Toledo, 1972. ED 088807.

Ives, L. A. Some notes on Piaget's account of the role of language in intelligent behaviour. Teacher of the Deaf, 1978, 1(2), 8-10.

Kaye, D. B., Hall, V. C., & Baron, M. B. Factors influencing rule discovery in children. Journal of Educational Psychology, 1979, 71(5), 654-668.

Kersh, B. Y. The motivating effect of learning by directed discovery, Journal of Educational Psychology, 1962, 53(2), 65-71.

Kersh, B. Y., & Wittrock, M. C. Learning by discovery: An interpretation of recent research. In DeCecco, J. P. (Ed.) The psychology of language, thought, and instruction. New York: Holt, Rinehart, and Winston, Inc. 1967, 394-402.

Koran, M. Differential response to inductive and deductive instructional procedures. Journal of Educational Psychology, 1971, 62(4), 300-307.

Koran, J. J., Jr., Koran, M., & Freeman, P. Acquisition of a concept: Effects of mode of instruction and length of exposure to biology examples. Audiovisual Communication Review, 1976, 24(4).

Kornbau, H. C. The practical implications of an informal conceptual analysis of the words, inquiry, and discovery as used in contemporary science education. (Doctoral dissertation, Temple University) Ann Arbor, Mich.: University Microfilms, 1977, No. 7713518.

Krieger, E. Shakespearean crossroads: Teaching Shakespeare through induction. College English, 1977, 39(3), 286-289.

Krumboltz, J. D., & Yabroff, W. The comparative effects of inductive and deductive sequences in programmed instruction. *American Educational Research Journal*, 1965, *2*, 223-234.

Kugel, P. Nothing worth learning can be taught. *Improving College & University Teaching*, 1979, *27*(1), 5-9.

Kuhfitting, P. K. F. Learning aids in the classroom: Experimental evidence of their effectiveness. *Education*, 1973, *94*(2), 135-136.

Lewis, J. S. Directed discovery learning: Catalyst to reading in the content areas. *Journal of Reading*, 1979, *22*(8), 714-719.

Loomer, N. J. *A multidimensional exploratory investigation of small group- heuristic and expository learning in calculus*. (Doctoral dissertation, University of Wisconsin-Madison) Ann Arbor, Mich.: University Microfilms, 1976, No. 7618892.

MacNeil, R. D. *The effects of a discovery and expository instructional style upon the change in the learning performance of field-dependent and field- independent undergraduate students*. (Doctoral dissertation, University of Iowa) Ann Arbor, Mich.: University Microfilms, 1979, No. 7928595.

Mayer, R. E. *Learning to solve problems: Roles of instructional method and learner activity*. Washington, DC: National Science Foundation. 1974. ED 091-225.

McDade, C. E. Subsumption vs education set: Implications for sequencing Instructional Materials. *Journal of Educational Psychology*, 1978, *70*(2), 137-141.

McLeod, D. B., & Adams, V. M. Relating field independence and a discovery approach to learning mathematics: A trait-treatment interaction study. Paper presented at the annual meeting of the American Educational Research Association, New York, April 1977.

Mollett, D. In support of inductive learning. *Educational Theory*, 1978, *28*(1), 62-67.

Moody, G. S. The interrelationship of maturation and development upon inquisitiveness in deaf children. Teacher of the Deaf, 1978, 6(2), 190-195.

Nelson, B. A. Effects of analytic-global and reflectivity-impulsivity cognitive styles on the acquisition of geometry concepts presented through emphasis or no emphasis and discovery or expository lessons. (Doctoral dissertation, University of Wisconsin) Ann Arbor, Mich.: University Microfilms, 1972, No. 7231693.

O'Brien, T., & Shapiro, B. Numbers patterns: Discovery vs. reception learning. Journal for Research in Mathematics Education, 1977, 8(2), 83-87.

Olander, H., & Robertson, H. The effectiveness of discovery and expository methods in the teaching of fourth grade mathematics. Journal for Research in Math, 1973, 4(1), 33.

Packer, J., & Bain, J. Cognitive style and teacher-student compatibility. Journal of Educational Psychology, 1978, 70(5), 864-871.

Pascarella, E. T. Interactive effects of prior mathematics preparation and level of instructional support in college calculus. American Educational Research Journal, 1978, 15(2), 275-285.

Pease, D. G. Initial learning, transfer, and relearning of serial motor tasks as a function of instructional strategies as well as task complexity and testing strategies. (Doctoral dissertation, Florida State University) Ann Arbor, Mich.: University Microfilms, 1975, No. 762687.

Pet rson, P. Aptitude X treatment interaction effects of teacher structuring and student participation in college instruction. Journal of Educational Psychology, 1979, 71(4), 521-523.

Prather, D. C. Trial-and-error vs. errorless learning: Training, transfer, and stress. American Journal of Psychgology, 1971, 84(3), 377-386.

Ray, W. Pupil discovery vs. directed instruction. *Journal of Experimental Education*, 1961, *29*(3), 271-280.

Reid, T. G. *Differences in creativity on relationships between creativity and achievement effected by the directed discovery and direct detailed teaching methods*. (Doctoral dissertation, Arizona State University) Ann Arbor, Mich.: University Microfilms, 1973, No. 7320432.

Rizzuto, M. F. Experimental comparison of inductive and deductive methods of teaching concepts of language structure. *The Journal of Educational Research*, 1970, *63*(6), 269-273.

Roesch, I. H. *Analyses of relationships between measures of self-actualization, discovery teaching climate, and selected characteristics of secondary science students in residential schools for the deaf*. (Doctoral dissertation, University of Idaho) Ann Arbor, Mich.: University Microfilms, No. 7529949.

Roughead, W. G., & Scandura, J. M. What is learned in mathematical discovery. *Journal of Educational Psychology*, 1968, *39*(4), 283-289.

Sakmyster, D. C. D. *Comparison of inductive and deductive programmed instruction on chemical equilibrium for high school chemistry students*. (Doctoral dissertation, Indiana University) Ann Arbor, Mich.: University Microfilms, 1972, No. 736993.

Salmon, G. Heuristic models for the generation of aptitude treatment interaction hypotheses. *Review of Educational Research*, 1971, *42*(3), 327-343.

Singer, R. To err or not to err: A question for the instruction of psychomotor skills. *Review of Educational Research*, 1977, *47*(3), 479-498.

Singer, R. N., & Gaines, L. Effects of promted and problem-solving approaches on learning and transfer of motor skills. *American Educational Research Journal*, 1975, *12*(3), 395-403.

Sowder, L. Further work on verbalization of discoveries. Journal of Research in Mathematics Education, 1975, 6(4), 223-227.

Sowder, L. The influence of verbalization of discovered numerical or sorting-task generalizations on short-term retention in connection with the Hendrix hypothesis. Journal for Research in Mathematics Education, May 1974, 5, 167-176.

Stefanich, G. P. Eliciting inquiry in earth science. Journal of Geological Education, 1979, 27(3), 111-113.

Stock, S. J. A comparison of abstract deductive and concrete inductive. Improving College and University Teaching, 1975, 23(1), 39-40.

Strike, K. A. The logic of learning by discovery. Review of Educational Research, 1975, 45(3) 461-483.

Tallmadge, G. K. Relationships between training methods and learner characterisctics. Journal of Educational Psychology, 1968, 59(1), 32-36.

Tallmadge, G. K., & Shearer, J. W. Interactive relationships among learner characteristics, types of learning, instructional methods and subject matter variables. Journal of Educational Psychology, 1971, 62(1), 31-38.

Tallmadge, G. K., & Shearer, J. W. Relationships among learning styles, instructional methods, and the nature of learning experiences. Journal of Educational Psychology, 1969, 60(3) 222-230.

Thomas, E. W. A comparison of inductive and deductive teaching methods in college freshman remedial English. (Doctoral dissertation, University of Pennsylvania) Ann Arbor, Mich.: University Microfilms, 1970, No. 7022866.

Thorndyke, P., & Hayes-Roth, B. The use of schemata in the acquisition and transfer of knowledge. Cognitive Psychology, 1979, 11, 82-106.

Tims, E. H., & Ives, L. An experiment in the teaching of Temporal Causal Sequencing Skills with a small group of severely subnormal hearing-impaired pupils. Journal of the British Association of Teachers of the Deaf, 1980, 4(1).

Tobias, S. Achievement treatment interactions. Review of Educational Research, Winter, 1976, 46(1), 61-74.

Veiga, J. F. Experiential Learning in Management Education: What Kinds of Students Benefit? College Student Journal, Spring, 1976, 10(1), 62-68.

Vernon, M. Fifty years of research on the intelligence of deaf and hard-of- hearing children: A review of literature and discussion of implications. Journal of Rehabilitation of the Deaf, Jan. 1968, 1(4), 1-12.

Watts, W. J. Deafness, thought and language and the influence of Piaget. Teacher of the Deaf, 1978, 2(4), 117-123.

Weimer, R. C. An Analysis of Discovery. Educational Technology, Sept. 1975, 15(9), 45-48.

White, R. T. Effects of guidance, sequence, and ATI on learning, retention and transfer of hierarchially ordered skills. Instructional Science, 1976, 5(2), 133-152.

Wright, D. P. Interactions between instructional methods and individual aptitudes in the teaching of critical thinking in social studies. (Doctoral dissertation, University of California, Berkeley) Ann Arbor, Mich.: University Microfilms, 1975, No. 7615430.

Yeany, R., Jr. A case from the research for training science teachers in the use of inductive/indirect teaching strategies. Science Education, Oct-Dec 1975, 59(4), 521-529.

Zimmermann, M. J., & Sassenrath, J. M. Improvement in reading and discovery learning in mathematics. Educational Research Quarterly, Spring 1978, 3(1), 27-33.

Problem Solving and Decision Making:
A Review of the Literature

Michael Steve

C. C. Cannonball was concerned. In his trucking business, time was money and he had spent too much of each the last time he road Interstate 77 through the mountains of Virginia. He recalled a shortcut he had heard about and decided he would try it out. So he turned off Interstate 81 onto VA 230 and headed south toward the Blue Ridge Mountains. Though the road was narrow and the curves tight, all went well for the first 50 miles. Then the headlights of his rig flashed upon a warning--UNDERPASS AHEAD : 14 FOOT LIMIT. C. C. Cannonball stopped his 14 foot 1 inch rig and sized up his dilemma. Though first resigned that he must head back the way he came, he decided to think about the situation a bit more. Fifteen minutes later, his now 13 foot 11 1/2 inch rig road slowly through the underpass, all of its tires nearly flat. He soon found a service station, filled his tires, and sped along VA 230 toward Greensboro.

Our lives are filled with situations which require attention in order to maintain an adequate level of functioning and growth. The process of finding and taking some action to deal with a situation has been alternately described as problem solving and decision making. Depending upon the consequences of one's action and the complexity of the situation, problem solving and decision making can range from crucial to mundane. And the individual's emotional reactions to success or failure may well be extreme in crucial matters but detached indifference in non-critical situations.

The goal in decision and problem situations can be described as arriving at a course of action which is the most satisfactory or at least one that does the job. The process of solving problems and making sound decisions can be differentiated, however. Gagne (1970) states that problem solving may be viewed as "...a process by which the learner discovers a combination of previously learned rules that he can apply to achieve a solution for a novel problem situation." Skinner (1966) suggests the following definition, "A question for which there is at the moment no answer is a problem." Davis (1973), in his excellent review on the subject, proposes a more general definition than Skinner's, i.e., a problem is "...a stimulus situation for which an organism does not have a ready response" C. C. Cannonball was faced with a problem when he met the bridge built too close to the road beneath it. The situation presented itself as a problem, i.e., a dilemma for which he had no ready response. He found a successful solution.

Maier (1968) suggests that in decision situations, the alternatives are given and the task facing the individual is one of selecting the best alternative. Viewing decision making in terms of a choice situation has been widely accepted in such diverse areas as counseling, management science and education. C. C. Cannonball considered two alternative routes each having positive and negative consequences, known and unknown. His choice (decision) was made based on available information.

Th soundness of a decision unlike a solution to a problem is oftentimes difficult to evaluate. In C. C. Cannonball's case there were many criteria associated with each alternative route--time, money, wear-and-tear on his rig, wear-and-tear on C. C. Cannonball. The multitude of criteria associated with decisions and the imperfect knowledge the decision maker has about the consequences of each makes the soundness of the decision difficult if not impossible to realistically appraise both for the decision maker and for an outside observer. In contrast, inherent to the problem situation is the criterion of success, i.e., "Was the problem solved?".

While there are differences between problem solving and decision making, they are often interrelated. For example, as in C. C. Cannonball's case, a problem situation evolved out of a decision. D'Zurilla and Goldfried (1971) outline another reasonable relationship. In their five stage problem solving model, they include a decision making step. Individuals who generate or discover multiple responses to problem situations then face a decision making situation. Thus, C. C. Cannonball, even though he found a way to proceed along VA 230, was faced with the decision of whether to implement that solution (and bear the consequences of riding on flattened tires) or to turn back (and among other things lose valuable time).

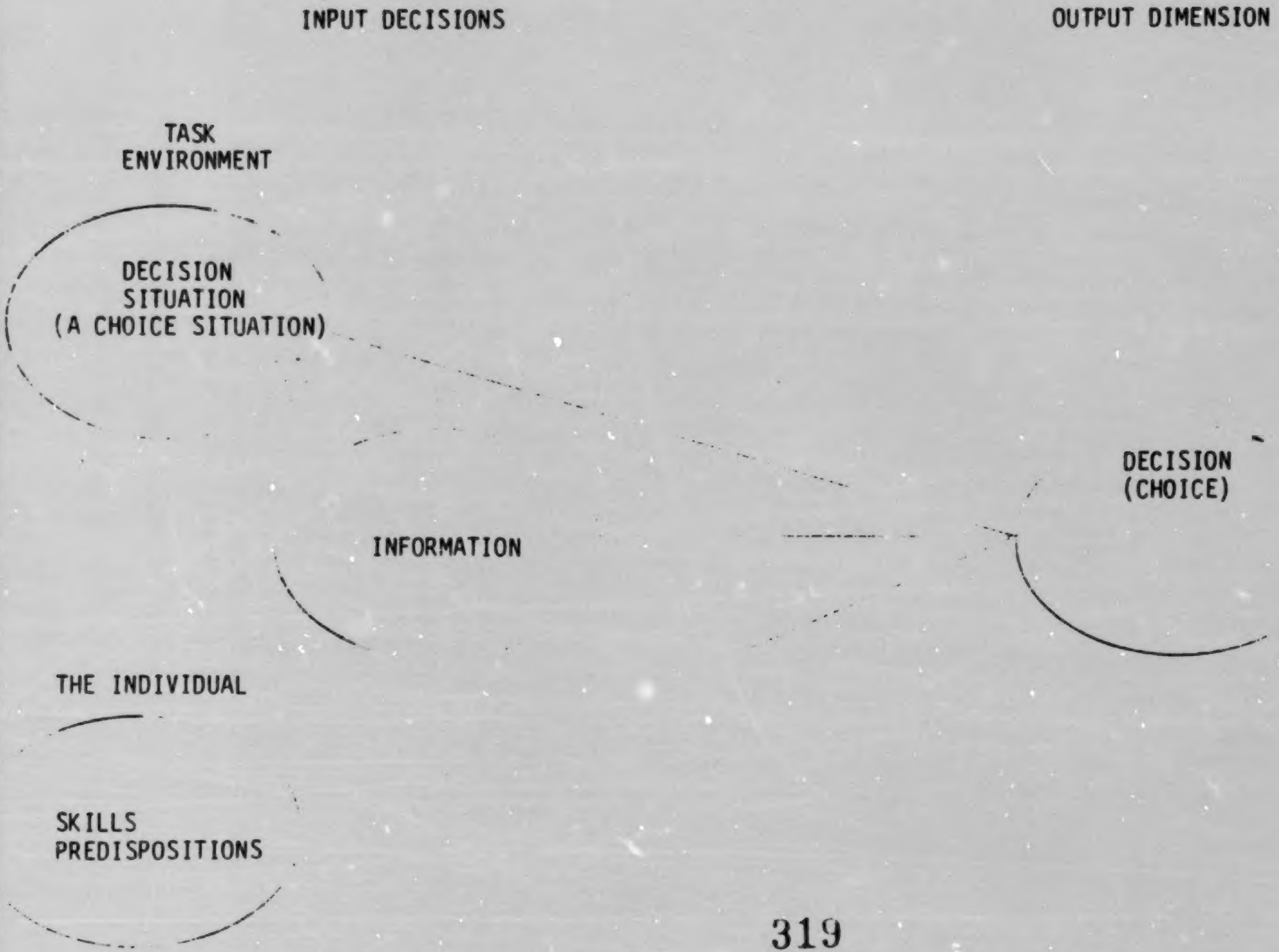
Together Figures 1 and 2 summarize many of the conceptual similarities and differences between problem solving and decision making. As is shown in these diagrams, the output of each process (a problem solution or a choice among alternatives) can be viewed as the function of the same three input dimensions: the task environment, the individual's skills and predispositions, and the information accessible.

Insert Figures 1 and 2 about here

This review deals with each process separately and for what are believed legitimate reasons. The task requirements placed on individuals in problem and in decision situations are different. Each kind of situation places on individuals certain characteristic skill and information requirements. Therefore, the conditions for promoting and training problem solving differ from those for decision making.

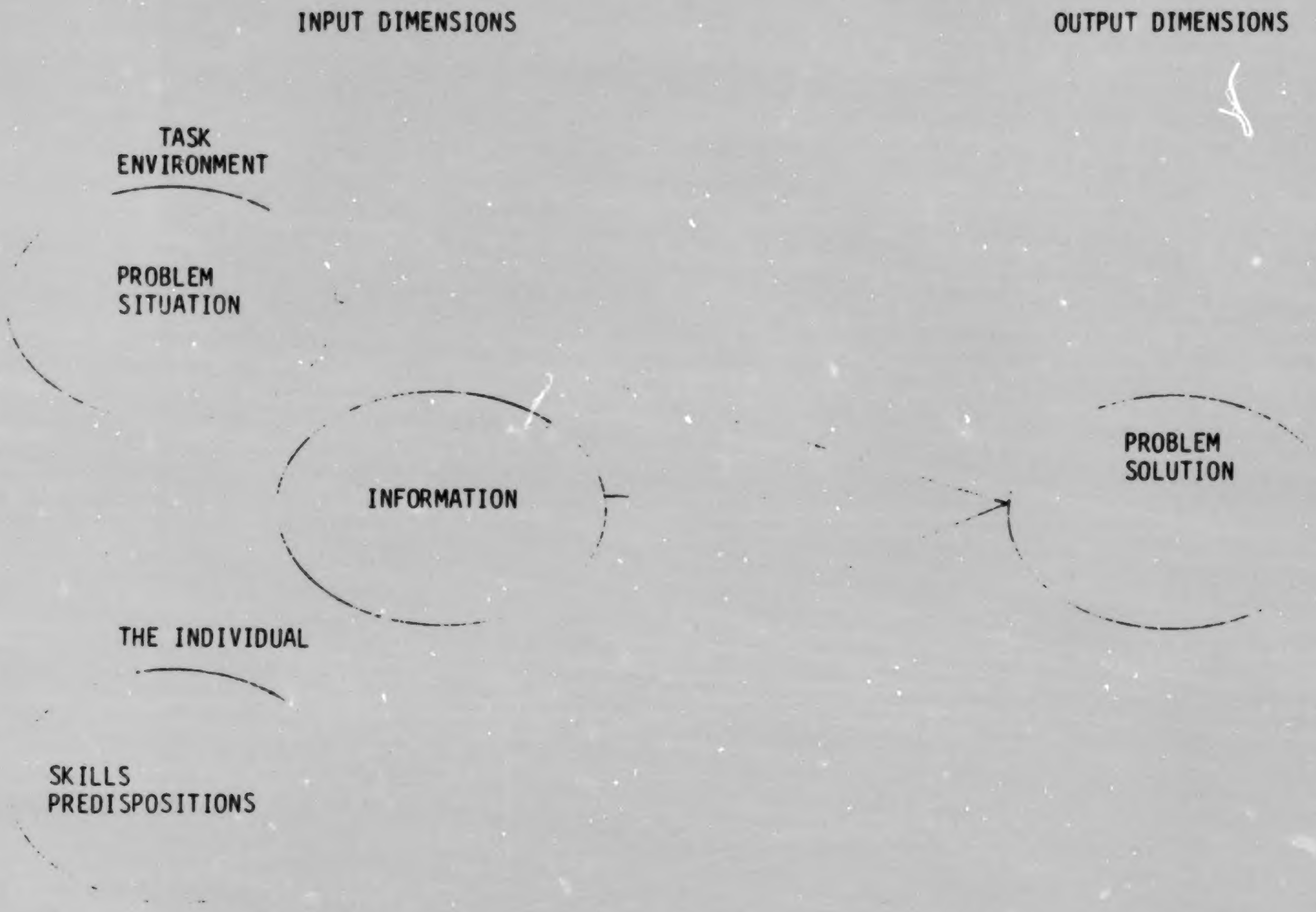
The models and concepts and the relevant research are reviewed first

FIGURE I: COMPONENTS OF DECISION MAKING PROCESSES


INPUT DECISIONS
OUTPUT DIMENSION
TASK ENVIRONMENT
DECISION SITUATION (A CHOICE SITUATION)
INFORMATION
DECISION (CHOICE)
THE INDIVIDUAL
SKILLS
PREDISPOSITIONS

BEST COPY AVAILABLE

FIGURE II: COMPONENTS OF PROBLEM SOLVING PROCESSES


INPUT DIMENSIONS
OUTPUT DIMENSIONS
TASK ENVIRONMENT
PROBLEM SITUATION
INFORMATION
PROBLEM SOLUTION
THE INDIVIDUAL
SKILLS
PREDISPOSITIONS

M.Steve-12A
12/2/80:df

BEST COPY AVAILABLE

for problem solving and then for decision making. In a closing section, implications from the problem solving and decision making literature are discussed, especially as they may apply to programs designed to support students deciding on a major course of study and/or a vocational path.

Problem Solving

The problem solving area is complex. The literature, while providing insights, is less than comprehensive and difficult to integrate. Because of the many kinds of problem situations (tasks) used for research purposes, the results and conclusions reported in studies must be examined carefully to determine the extent to which they can be generalized beyond the boundary conditions established within the studies themselves.

Models and Concepts

Heppner (1978) has described the two basic approaches to the area both of which continue to have their supporters. "On the one hand, investigators such as Gagne (1964) and Skinner (1974) have focused mainly on the past experience of the individual as the most important variable in problem solving. Other investigators (e.g., Kohler, 1925; Maier, 1970) have maintained that it is largely the individual's perception of the situation which is of utmost importance in solving a problem. Since the controversy began in the early 1900s many experiments have been performed in an attempt to clarify the crucial variables in the problem solving process. Although more is now known about problem solving, how people solve problems is still largely unknown." This same "major theoretical schism" is noted by Davis (1973); he devotes a chapter describing each conception, past experience and perception, from basically a historical perspective.

In a recent article Greeno (1978) has described the trends in problem solving. He notes that the behavioristic and associationistic traditions of experimental psychology have been largely abandoned, as have many of the past popular ways of studying problem solving behavior, e.g. anagrams, puzzles, and concept identification tasks (Bruner, et al., 1956).

With increasing frequency researchers are using and specifying detailed process models. Newell and Simon (1972) state ". . . psychological analyses of problem solving now attend to the nature and organization of component processes that interpret information, set goals, and select among actions in the process of solving the problem" (p. 15). Consistent with and part of this transformation to process models has been the use of increasingly complex and diverse tasks to study problem solving.

Whereas psychologists use models of processes and subprocesses to describe the underlying cognitive operations used in approaching a task, others have outlined a sequence of tasks using step models. Davis (1973) describing a number of such models observes that they are elaborations of a two-phase process: problem awareness and problem solution. For example, Koberg and Bagnall (1976) outline a seven stage model which can be divided into an awareness phase (accept situation, analyze, define) and a solution phase (ideate, select, implement, evaluate). An analysis of these and other models (e.g., Parnes, 1967; Crutchfield, 1969) reveals more similarities among the stages than differences and a universal inclusion of a problem awareness phase followed by a problem solution phase.

Greeno observes that most current work in the psychology of problem solving views problem solving as a search among sequences of operations. He describes a concept frequently inherent in problem solving models, means-end analysis. Greeno defines means-end analysis as ". . . a general heuristic used in organizing work on a problem. In means-end analysis, the problem solver compares the current situation with the goal situation to identify the differences between them. These differences become the focus of work on the problem, and the problem solver sets sub-goals of trying reduce the various differences that are found" (p. 16). This analytical technique is consistent with the previously mentioned distinction found in most step models. Thus, identifying or defining differences between the current situation and the goal can be viewed as the critical step in the problem awareness phase. And, identifying the means and working towards meeting the subgoals can be described as the critical feature in the problem solution phase.

When discussing the extent to which problem solving capabilities are generalizable (or alternately, programs can make problem solving generalizable) two questions arise of interest to the practitioner. First, to what degree do problem strategies and solutions generalize to similar but different problems? Studies addressing this question are commonly termed transfer of training studies. Second, to what extent are problem solving skills retained and how reliable is the performance over time?

The literature on transfer of training is as an uneven and eclectic group of studies as those that make up the problem solving literature. While transfer of training studies are not reviewed here, it is useful to point out that some authors in the areas caution against the assumption of transfer to other tasks without actually testing that assumption out. After citing studies documenting the facilitative effects of procedures as they are applied in discrete problem situations (Davis, 1966; Bergen & Garfield, 1971; Krumholtz & Thorensen, 1976), Dixon et al.(1979) note that ". . . the generalizability of these solutions and the improved ability of clients to deal with future problem situations has not been empirically supported."

Newell and Simon (1972) propose that there may be insufficient reason to assume intelligence is generalizable over different task domains, and that without positive results, the question of whether generic skills exist ". . . generally remains an empirical question, to be settled by evidence, not definition" (p. 84).

In contrast to the transfer of training issue, the question of retention of problem solving skills over time has at least been partially answered. Numerous studies have shown that while rules (strategies, procedures, algorithms, heuristics) are resistent to forgetting over periods of many months, people have demonstrated a significant loss of retention of information and facts beginning soon after acquisition (Ausubel, 1968; Gagne, 1970). Both skills and information are necessary for successful problem solving. Consequently, the degree to which the individual remains successful with a particular type of problem would seem to be a function of the initial success an individual has within the problem situation and the relative degree to which skills rather than information are necessary for the resolution of the problem.

A number of models and ideas are available to practitioners. Whereas cognitive process models and stage process models and such techniques as means-end analysis have intuitive appeal and provide a useful research framework, they remain only suggestive and do not by themselves provide sufficient direction to educators, counselors and the like.

Over the past twenty years, Gagne has consistently pointed to the importance of prior learnings and prerequisite skills for the successful performance in problem solving tasks. He (1970) describes a method, task analysis, by which the prerequisite skills, i.e., skills necessary for success, can be identified. He goes on to specify the different types of skills possible and the conditions by which they can be promoted. Using the task analysis method, one can better predict whether an individual with a particular set of capabilities will or will not be successful with a given task, and more importantly, which skills should be developed to ensure success. Of special concern to educators would be those rules (strategies, procedures, algorithms, heuristics) and their underlying concepts which act as the important prerequisite capabilities for effective problem solving.

Whereas Gagne's method requires looking at each problem situation as a separate task for analysis, D'Zurrilla and Goldfried (1971) present a five-stage process model and then for each stage describe those types of generic skills necessary for successful problem solving and some general guidelines for their promotion. Heppner (1978) takes the same model and applies it to resolving personal problems and suggests types of counseling approaches which may be employed to promote the kinds of generic skills inherent at each stage.

Training

Educators, counselors, and other practitioners have been more concerned with improving problem solving capabilities than in engaging in psychological modeling or generating descriptive step models. The following sections describe some implications for training which follow from models and research associated with the past experience and the perception perspectives.

Past experience perspective and training. Those who view past experience as most critical, have examined ways of identifying what kinds of prior learnings are critical to a given problem situation and have suggested the conditions under which prerequisite capabilities can be brought about. Gagne and his associates among others have studied those capabilities important to quality problem solving. A number of studies have shown training in the use of applicable problem solving strategies has improved problem solving performance, though the evidence is heavily weighted with problem solving in formal laboratory tasks (cf. Davis, 1966). Steve (1980) demonstrated that training in rule application, that is, using a strategy or algorithm, led to improved performance in two problem solving tasks. In addition, practice in rule selection, choosing the most appropriate rule for a particular class of problem situations, improved performance in these tasks.

The perception perspective and training. Changing the individual's perception of the situation (the thrust of the perceptual approach) has been associated with such problem solving techniques as attribute listing, morphological synthesis, idea listing, synectics (making analogies) and brainstorming (Davis, 1973). Except for brainstorming, these techniques lend themselves to solving problems by individuals working alone. The perceptual approach and techniques such as these are most related to the process of creating or discovering a novel response to a problem situation sometimes referred to as "creative problem solving".

What kinds of training experiences facilitate insightfulness and creative problem solving? What allowed C.C. Cannonball to arrive at his "insightful" solution? Study in this area has been difficult in large part because there is a lack of consensus on what creativeness is and how to measure it (Davis, 1973).

Summary. Many programs have been established to promote problem solving and many are reported in the literature. Feldhusen and Treffinger (1977) provide a useful guide and review to available instructional materials and books in the creative thinking and problem solving areas.

A wide range of problem solving strategies are taught in these programs and materials, among them, means-end analysis, goal setting, brainstorming, and using analogies.

Decision Making

Bross (1953) states that "decision-making is...the process of selecting one action from a number of alternative courses" (p. 1). This definition has received acceptance by management scientists, psychological researcher, and counselors. Janis and Mann (1977), Gelatt (1966) and others include two activities in the decision making process: a search and collection of information activity and an appraisal activity. Janis and Mann view the vigilant decision maker as "...searching for and deliberating about information concerning the alternatives open to him" (p. 14). The requirements for making a good decision according to Gelatt (1966), include a search for "adequate and relevant information" and "an effective strategy for organizing, analyzing and synthesizing the information in order to arrive at a choice" (p. 13).

Models and Concepts

In the study of decision making, three general approaches appear in the form of normative, dynamic, and descriptive models (Wilcox, 1972; D'Zurilla & Goldfried, 1971; Janis & Mann, 1977). Normative models prescribe sets of rules, many times represented as a mathematical equation, which supposedly allow a decision maker to select from a set an optimal alternative. Descriptive models describe how an individual or group actually goes about making a decision. Both normative and descriptive models represent the task environment (or decision space) as static and unchanging where the task is to select from among a set of fixed and definable alternatives.

In contrast, those opting for a dynamic approach view the task environment as somewhat unstable, and a function of how the individual views the situation at a particular point in time. The process of making a decision, consequently, is seen as more complex and less static than a choice from among an externally determined set of alternatives. Subsequent sections describe more fully the three models, and discuss studies germane to each. A final section describes decision-conflict theory (Janis & Mann, 1977), a comprehensive treatment of available research which has interesting implications for programs designed to promote decision making.

Before turning to these sections, however, it is useful to note that authors in the decision making area avoid use of step or stage process models, so popular in the problem solving area. Janis and Mann (1977) represent the exception. They propose that an individual may have different concerns (questions) at different stages of making decision.

STAGE	KEY QUESTIONS
1. Appraising the Challenge	Are the risks serious if I don't change?
2. Surveying Alternativees	Is this (salient) alternative acceptable means for dealing with the challenge? Have I sufficiently surveyed the available alternatives?
3. Weighing Alternatives	Which alternative is best? Could the best alternative meet the essential requirements?
4. Deliberating about Commitment	Shall I implement the best alternative and allow others to know?
5. Adhering despite Negative Feedback	Are the risks serious if I don't change? Are the risks serious if I do change?

(p. 172)

Janis and Mann warn, however, that this five-stage sequence should not "...be taken as establishing an ironclad law that specifies the steps every decision must invariably go through" (p. 178). They stress that for both good and poor decision making patterns some steps may be perfunctory or omitted and that decision makers may spiral back to earlier phases at any point. The assumption that an individual's attention and psychological state will show shifts as that individual "moves through" a decision is a cornerstone of the decisional-conflict theory.

Normative models

Normative models were heavily represented in the literature during a period spanning the 1940s through the 1960s. The models have evolved from microeconomic theory and are heavily represented in studies based on utility theory (Wilcox, 1972; D'Zurilla and Goldfried, 1971). Psychologists incorporated and adapted some of these ideas into models of human decision making.

> Following the paradigm described by Edwards (1961), the expected utility of any alternative may be arrived at by a joint consideration of the value of each outcome, as well as by the likelihood that the alternative will result in achieving this outcome. The utility model which most closely parallels human behavior in problematic situations is one which involves a subjective estimate of the probability that each particular alternative will achieve any given outcome, as well as subjective determination of the value of the various outcomes. Edwards has referred to this as the subjectively expected utility model of human choice (D'Zurilla & Goldfried, p. 18).

The normative approach remains a fixture in contemporary management decision theory and practice. Management science and operations research rely heavily on statistical methods and quantifiable data as well as linear and dynamic programming techniques, Monte Carlo and game theory models and simulation models (Greenwood, 1969). While these techniques have definite worth when optimizing outcomes such as profit and utility, they have been criticized when applied to individual human decision making. Janis and Mann (1977) present a cogent summary of these criticisms.

> Specialists on organizational decision making desribe the optimizing strategy as having the goal of selecting the course of action with the highest payoff. Such a strategy requires estimating the comparative value of every viable alternative in terms of expected benefits and costs (see Young, 1966, pp. 138-47). But, as Herbert Simon (1976) has pointed out, human beings rarely adopt this decision-making approach: people simply do not have 'the wits to maximize' (p. xxviii). Part of the problem is that determining all the potentially favorable and unfavorable consequences of all the feasible courses of action would require the decision maker to processs so much information that impossible demands would be made on his resources and mental capabilities. In his attempts to obtain the degree of knowledge needed to anticipate alternative outcomes, the decision maker is likely to be overwhelmed by 'information inundation, which can be quite as debilitating as information scarcity' (Miller and Starr, 1967, p. 62). Moreover, so many relevant variables may have to be taken into account that they cannot all be kept in mind at the same time. The number of crucially relevant categories usually far exceeds 7 ± 2, the limits of man's capacity for processing information in immediate memory (see Miller, 1956). Handicapped by the shortcomings of the human mind, the decision maker's attention, asserts Simon, 'shifts from one value to another with consequent shifts in preference' (p. 83). (p. 21-22).

Optimizing strategies may seem like an ideal approaches for decision makers. However, there remain serious questions whether individuals can effectively weigh and appraise the costs and benefits of available alternatives. Miller and Starr (1967) argue that it is difficult to quantify or even identify the kinds of values and the psychological and sociological forces at work on an individual in a decision situation. In addition, numerous studies shed doubts on the assumption that individuals can successfully process or retain substantial amounts of information. Some studies relating to the question of information collecting and use are reviewed in the next section "Descriptive Approaches".

Descriptive Approaches

Whereas normative approaches lead to suggestions of how individuals should act to make quality decisions, descriptive approaches take a step back and ask how individuals do act making decisions. The approach, more empirical in its orientation, invites research studies rather than casting doubt on their necessity. Studies examine the relationships among the inputs (information, choices, personalogical characteristics, etc.) and the output. A number of studies have investigated the effects of information on resulting decision making behaviors.

A good decision requires adequate and relevant information as it relates to possible alternative actions, possible outcomes, the probability of outcomes, and the desirability of outcomes and their consequences (Gelatt, 1966). With some interesting exceptions, studies have shown that people with low to medium amounts of information to process make effective decisions and remain continuously open to new and relevant information.

Lanzetta and Driscoll (1968) studied the joint effects of uncertainty and importance on information search. They found that search increased in conditions promising greater gains and in conditions, promising greater losses. Search also increased in conditions of greater uncertainty. Post-hoc analysis suggested that the effects of importance and uncertainty were additive. Also, importance effects were in part mediated by uncertainty, i.e., the more important a decision, the more uncertainty was created. Corman (1957) reported that success in problem solving increased as the amount of information on how to attack a problem increased.

In a study which throws some doubts on the notion that people give attention to information regardless of its form, Borgida and Nisbett (1977) concluded that information is used in proportion to its vividness. They found that brief fact-to-face comments about undergraduate courses had a greater impact upon course selections than did printed course evaluations using ratings of students who previously had taken the courses.

A serious challenge to the notion that individuals act as open and unbiased decision makers has been the selective exposure hypothesis.

> The selective exposure hypothesis, regarded by an earlier generation of behavioral scientists as a fundamental tenet of social psychology, postulates that people generally censor their intake of messages in a highly biased way so as to protect their current beliefs and decisions from being attacked (see Klapper, 1949). A supplementary postulate is that people generally seek out communications that support their prior attitudes and decisions, especially when they inadvertently encounter negative feedback that makes them less confident. Thus, the selective exposure hypothesis asserts that people generally seek messages with which they agree and avoid those with which they disagree...the selective exposure hypothesis became a linchpin in various consistency theories (e.g., Festinger, 1957). Until the mid-1960s, deviations from the hypothesis were usually regarded as unimportant exceptions to the general rule, rather than as grounds for reconsidering it. (Janis and Mann, 1977, p. 203).

Freedman and Sears (1965) and Sears and Abeles (1969) reviewed numerous studies and, in seeming refutation to the selective exposure hypothesis, found that there were nearly as many studies indicating a preference for non- upportive information as for supportive information, and the most prevalent finding was "no preference".

> Nonconfirming studies show that a number of specific factors, such as the message's utility (Canon, 1964; Lowe and Steiner, 1968); ease of refutability (Lowin, 1967; Kleinhasselink and Edwards, 1975), topical interest and novelty (Atkin, 1973) can offset, if not swamp, whatever selectivity tendency there might be.

Dynamic Approaches

As was stated previously, most descriptive and normative models assume a static decision space where the alternatives are finite and fixed. Furthermore, the models characterize the decision maker as one who attempts to use an optimizing strategy to find the "best" alternative against a background of personal trait characteristics, such as values, interests, etc. Those using a dynamic approach take pains to avoid making the assumptions which underly such charcterizations. For them, the decision situation or decision environment need not be static, and the individual decision maker may use different strategies and have different sets of internal influencers from situation to situation and from one time to another. The often observed and reported phenomena of vacilliation and the common occurrence of "changing one's mind" lend some credence to looking for something other than the rational and static world assumed in most decision making models.

The attempt to understand the information processing activities of the individual decision maker has been pioneered by Herbert Simon and his associates (Wilcox; 1972). To study how decisions are made, techniques which involve thinking aloud protocols and closely monitorng the information processing activities of individuals in complex and changing environments have been used. Attempts to model the individual problem solver using computer logic (Newell & Simon, 1971; Greeno, 1978) represent a conplementary extension of this same approach in the problem solving literature.

If the individual does not use an optimizing strategy and a set of fixed personal values, what is the process? Simon believes that in most decisions, especially those in complex or changing environments, individuals employ a "satisficing" strategy rather than an optimizing strategy. That is, they look for an alternative which meets or exceeds a set of minimal requirements which may or may not be influenced themselves as the search continues.

> Simon argues convincingly that the satisficing approach fits the limited information-processing capabilities of human beings. The world is peopled by creatures of 'bounded or limited rationality', he says, and these creatures constantly resort to gross simplifications when dealing with complex decision problems. Man's limited ability to foresee future consequences and to obtain information about the variety of available alternatives inclines him to settle for a barely 'acceptable' course of action that is 'better than the way things are now'. He is not inclined to collect information about all the complicated factors that might affect the outcome of his choice, to estimate probabilities, or to work out preference orderings for many different alternatives. He is content to rely on 'a drastically simplified model of the buzzing, blooming confusion that constitutes the real world' (Simon, 1976, p. xxix). (Janis & Mann, 1977, p. 26).

The arguments proposed by researchers and thinkers such as Simon pose serious problems for those desiring to build broadly generalizable decision making model as well as to those practitioners who are desiring one model which will generalize across situations, people, and time. Unfortunately, for practitioners, the dynamic approach, has produced little which can be used by those concerned with prediction and change. And furthermore, because of its reliance on simple and artificial tasks delivered in laboratory settings, dynamic approaches have missed the complex and emotional sides of decision making.

A Conflict Model of Decision-Making

Whereas individuals would appear to have an inclination to search out and use information effectively, they do not always. Why not? Three plausible explanations. First, as within problem solving situations, individuals can fail because they do not possess the prerequisite skills to search out, recognize and use relevant information. This could be termed the "learning deficit" explanation. Second, in situations which are complex and the information requirements great, the individual's information processing capabilities are taxed beyond his or her abilities. The "biological limitations" explanation (or alternatively, the "Hey, I'm only human" explanation) has been described by Simon (1976). A third possible explanation of poor decision making involves the conflict individuals feel in decision situations with important consequences. This section concludes with an analysis of miscalculation under conditions of "decisional conflict".

The decisional-conflict model may be unique among all decision making and problem solving models. Janis and Mann are unwilling to assume as the standard the idealized behavior of a coldly rationale decision maker, as it is the standard implied in those using normative and most other descriptive approaches.

Instead they focus on an individual's cognitive functioning and psychological state during and after making a decision. In this way, there exists a meaningful similarity to writers and researchers who it could be said use a dynamic approach. On the other hand, the conflict model differs from those using a dynamic approach in critical ways. First, consistent with other descriptive models, the conflict model assumes a static decision space made up of a finite and fixed set of choice alternatives. Second, Janis and Mann sample from a wide range of psychological research and are less behavioristic in their approach and description. And third, they state that research results based on artificial, laboratory tasks, one of the trademarks of those adopting a dynamic approach have questionable generalization to real life situations.

What is the conflict model? The model attempts to relate sets of antecedent conditions to sets of possible consequences and to specify the psychological constructs and processes which mediate the two.

> What is unique about the model is the specification of conditions relating to conflict, hope, and time pressure that mediate distinctive decisional coping patterns. Our claim is that the five coping patterns are linked dependably with the conditions we have specified, a claim that has testable implications about environmental circumstances that generate vigilance and about deliberate interventions that could counteract the beliefs and perceptions responsible for defective coping patterns. (p. 72)

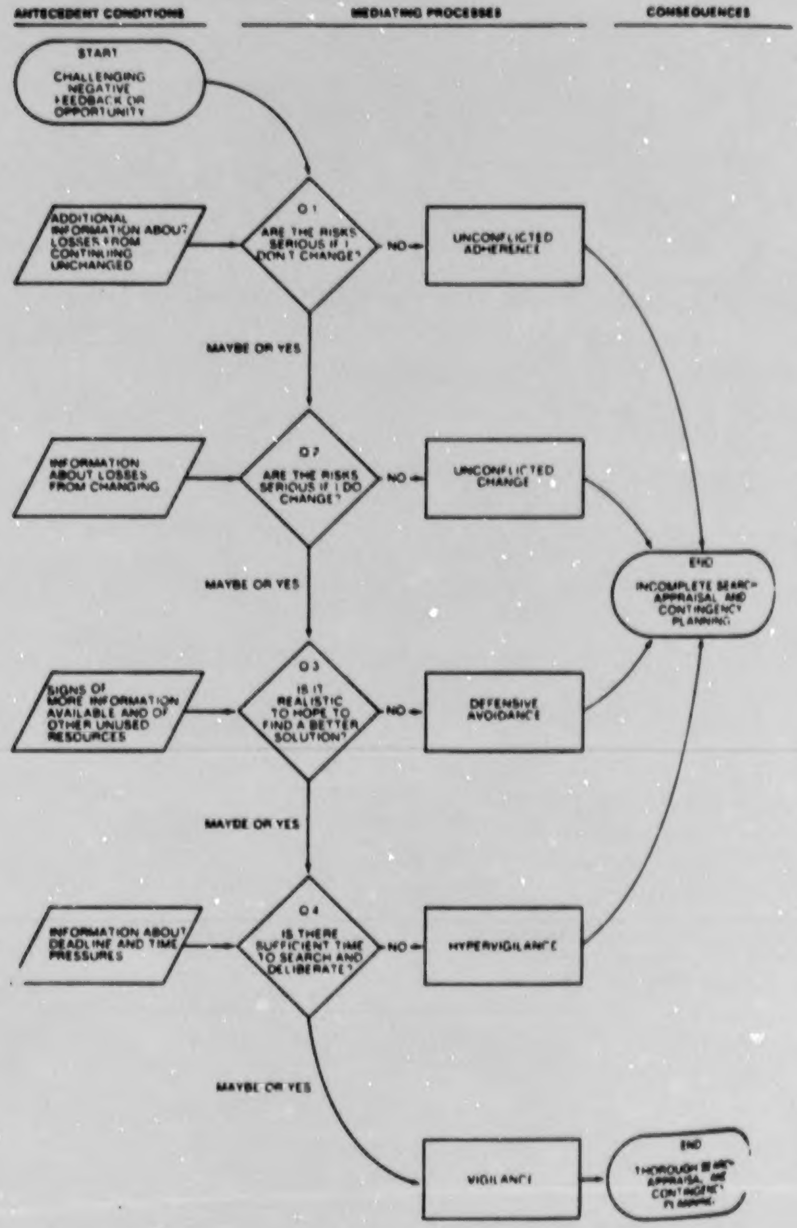
The theory involves a number of formulations. Those parts of the theory which are thought to have the most interest to practitioners are included in the following pages. The heart of the theory, a conflict-theory model of decision making, has been included in Figure 1.

Insert Figure 3 about here

According to this model, the decision maker who answers "yes" or "maybe" at each decision point in dealing with a consequential decision is prepared to carry through with those activities associated with high quality "vigilant" decision making.

> (The four "less-than-vigilant" patterns)...are occasionally adaptive in saving time, effort, and emotional wear and tear, especially for routine or minor decisions that do not have serious consequences. But they often result in defective decision making when the decision maker is confronted with a vital choice that has serious consequences

FIGURE 3. A conflict-theory model of decision making applicable to all consequential decisions.


ANTECEDENT CONDITIONS
MEDIATING PROCESSES
CONSEQUENCES
START
CHALLENGING NEGATIVE FEEDBACK OR OPPORTUNITY
ADDITIONAL INFORMATION ABOUT LOSSES FROM CONTINUING UNCHANGED
Q1
ARE THE RISKS SERIOUS IF I DON'T CHANGE?
NO
UNCONFLICTED ADHERENCE
MAYBE OR YES
INFORMATION ABOUT LOSSES FROM CHANGING
Q2
ARE THE RISKS SERIOUS IF I DO CHANGE?
NO
UNCONFLICTED CHANGE
END
INCOMPLETE SEARCH APPRAISAL AND CONTINGENCY PLANNING
MAYBE OR YES
SIGNS OF MORE INFORMATION AVAILABLE AND OF OTHER UNUSED RESOURCES
Q3
IS IT REALISTIC TO HOPE TO FIND A BETTER SOLUTION?
NO
DEFENSIVE AVOIDANCE
MAYBE OR YES
INFORMATION ABOUT DEADLINE AND TIME PRESSURES
Q4
IS THERE SUFFICIENT TIME TO SEARCH AND DELIBERATE?
NO
HYPERVIGILANCE
MAYBE OR YES
VIGILANCE
END
THOROUGH SEARCH APPRAISAL AND CONTINGENCY PLANNING

BEST COPY AVAILABLE

> for himself, for his family, or for the organization on whose behalf he is making the decision. These four patterns are: (1) unconflicted inertia; (2) unconflicted change to a new course of action; (3) defensive avoidance; and (4) hypervigilance. (p. 52)

The behavorial consequences of each of the five patterns are described in Table 1. Each pattern is analyzed against the seven criteria which it is maintained act as criteria for thorough search and appraisal activities.

Insert Table 1 about here

Table 2 extends the theory to the behavioral and psychological consequences of individuals who demonstrate each of the five decision making patterns.

Insert Table 2 about here

Together Figure 3 and Tables 1 and 2 outline the major components of the conflict theory model. It should be noted that Janis and Mann have rigorously reviewed studies which provide tests for the predictions inherent in these formulations. They have therefore been successful in integrating a large body of research investigating ways that people react and make decisions in conflict-inducing choice situations.

The authors emphasize that the theory is limited to decision situations which have serious consequences. Only in such conflict-inducing conditions, are the potentially debilitating psychological conditions present to impede quality decision making. Whereas other models imply that individuals can somehow control these psychological reactions and that individuals act in a cool and objective manner, Janis and Mann disagree with the contention.

TABLE 1 Predecisional behavior characteristic of the five basic patterns of decision making.

	Criteria for High-quality Decision Making							
	(1)	(2)	(3)		(4)	(5)	(6)	(7)
			CAREFUL EVALUATION OF CONSEQUENCES					
PATTERN OF COPING WITH CHALLENGE	THOROUGH CANVASSING OF ALTERNATIVES	THOROUGH CANVASSING OF OBJECTIVES	*a. of current policy*	*b. of alternative new policies*	THOROUGH SEARCH FOR INFORMATION	UNBIASED ASSIMILATION OF NEW INFORMATION	CAREFUL RE-EVALUATION OF CONSEQUENCES	THOROUGH PLANING FOR IMPLEMENTATION AND CONTINGENCIES
Unconflicted adherence	−	−	−	−	−	+	−	−
Unconflicted change	−	−	+	−	−	+	−	−
Defensive avoidance	−	−	−	−	−	−	−	−
Hypervigilance	−	−	±	±	±	−	−	−
Vigilance	+	+	+	+	+	+	+	+

KEY: + = The decision maker meets the criterion to the best of his ability.
− = The decision maker fails to meet the criterion.
± = The decision maker's performance fluctuates, sometimes meeting the criterion to the best of his ability and sometimes not.

All evaluative terms such as *thorough* and *unbiased* are to be understood as intrapersonal comparative assessments, relative to the person's highest possible level of cognitive performance.

BEST COPY AVAILABLE

TABLE 2. **Manifestations of conflict and related symptoms of stress for each of the five basic patterns of decision making.**

PATTERN OF COPING WITH CHALLENGE	SUBJECTIVE BELIEFS (INDICATORS OF MEDIATING PSYCHOLOGICAL CONDITIONS SPECIFIED IN FIGURE 3–2)	LEVEL OF STRESS	DEGREE OF VACILLATION OF PREFERENCE FOR ALTERNATIVE COURSES OF ACTION
1. Unconflicted adherence	· No serious risk from current course of action	*Low*: persistently calm	No vacillation
2. Unconflicted change	· Serious risk from current course of action · No serious risk from new course of action	*Low*: persistently calm	No vacillation
3. Defensive avoidance	· Serious risk from current course of action · Serious risk from new course of action · No better solution can be found	*Variable* from low to high (predominantly pseudo-calm, with breakthrough of high emotional arousal when signs of threat become salient)	Little or no vacillation (except when signs of threat are salient)
4. Hypervigilance	· Serious risk from current course of action · Serious risk from new course of action · A better solution might be found · Insufficient time to search for and evaluate a better solution	*High*: persistently strong anxiety	Very high rate of vacillation, but occasionally practically none as a result of perseveration
5. Vigilance	· Serious risk from current course of action · Serious risk from new course of action · A better solution might be found · Sufficient time to search for and evaluate a better solution	*Moderate*: variations within intermediate range, with level depending upon exposure to threat cues or reassuring communications	Moderate to high rate of vacillation (depending on content of new information

> Human beings, programmed as they are with emotions and unconscious motives as well as with cognitive abilities, seldom can approximate a state of detached affectlessness when making decisions that implicate their own vital interests or those of their organization or nation. (p. 72)

While such an assumption may appear pessimistic, it may also be realistic. Numerous studies demonstrate that individuals do not make decisions in a rationale and detached manner.

The decisional-conflict theory's formulations are convincing largely because of the weight of the research supporting them. These formulations stand alone in their potential for providing practitioners with a unified approach for diagnosing the decision making process. Whereas most other problem solving models view steps and stages as critical factors in information search and appraisal activities, the conflict position maintains that it is the coping pattern that is determining.

> Irrespective of the specific stage of the decision, the decision maker will be either indifferent, defensively avoidant, hypervigilant, or discriminately vigilant with respect to relevant information, depending upon the antecedent conditions determining his model of coping response. (p. 213)

Implications of this model, especially as they relate to the three maladaptive coping patterns mentioned above indifference--encompassing both unconflicted inertia and unconflicted change to a new course of action, defensive avoidance, and hypervigilance, will be discussed in the next section.

IMPLICATIONS

In this section implications from the problem solving and decision making literature are discussed. The focus of this section are high school and college students who are deciding on a school to attend, a major course of study, an occupation, or a career path. Consequently, of special interest are vocational decision making models and studies. Some of these studies are introduced and discussed in this section. A primary question which this section addresses is, "What types of interventions (programs) can provide assistance and support to students as they make decisions related to vocational choices."

While many writers take care to distinguish among "career decision making", "vocational decision making", and "choosing a major", this section uses the single term "vocational decision making". This is not to imply that there aren't purposes served by distinguishing among these terms. Rather it is a recognition that the decisions implied in these areas have many crucial similarities. There exists a strong relationship among the sets of options available when selecting a major, a graduate school, a first job, an occupation, etc. The inputs into making these various decisions (eg., the values and interests of the individual, vocational information, etc.) are also in large part similar in nature.

T is section presents eleven guidelines. It is believed that these guidelines have application to various kinds of programs, i.e., any kind of intervention. Among programs which could be impacted are those designed 1) to instruct students in skills important to making vocational decisions (educational programs), 2) to assist and support students with vocational decisions (e.g. career counseling programs), and 3) to assist students with personal and interpersonal problems and decisions (e.g. life skills programs).

Studies which support the first two guidelines were reviewed and described in the problem solving review section.

1. Prior learning is critical to success in a problem situation. A task analysis provides a method for identifying necessary prerequisite skills.

2. The questions of whether general problem solving skills exist or whether an individual's success in one situation can transfer to another situation are empirical in nature and should be so treated.

A task analysis procedure (Gagne, 1970) can facilitate identification of skills necessary for successful problem solving and decision making. An individual's skill level can be assessed or assumed and instructional interventions provided to meet skill deficits identified or assumed. Such a procedure is successful with a specific, limited "task" situation. Consequently, for the procedure to have a reliable payoff, efforts need to be made to identify rather precisely the kinds of problems and decisions with which students must deal, and the skill requirements implied within each problem decision situation.

The studies reviewed fail to offer much support to the conclusion that general problem solving or decision making models are useful. (These models do, however, have some value as descriptive vehicles.) Identification of a set of principles which help define the degree to which transfer of skills can be expected from one situation to another or the conditions under which such transfer could be expected were beyond the scope of this review. Without such guidance, the practitioner would seem wise to adopt the following strategy: 1) Identify important problem and decision situations for which student success is deemed critical; 2) Use a task analysis procedure (or other procedure(s)) to identify the skills necessary for success in each of these situations; 3) Develop/modify programs; 4) Implement the program and establish within it methods by which it can be determined if transfer of training is occurring. This last recommendation addresses the fact that while general problem solving/decision making skills may exist and/or transfer of training may occur, it is less costly to test the assumptions inherent in such acceptance than not to test them.

No program can deal with all difficult situations students face but it seems a prudent course would involve equipping students with the necessary skills to resolve the more critical problems and to act vigilantly in important decisions areas such as choice of major and choice of occupation. The evidence is not available that instruction in how to understand and use "all-purpose" problem solving and decision making models will be sufficient in promoting skills applicable to different kinds of problem situations or meet the specific learning requirements in specific problem/decision situations.

3. Individuals are biologically limited information processors.

Studies have revealed that people can maintain no more than five to nine "chunks" of information active in immediate memory at any one time.

Furthermore, human subjects have shown to be limited to storing one chunk of information in long-term memory every seven or eight seconds. Such limitations have implications for success in complex problem and decision situations where the information requirements are great as could be expected in situations involving choosing a vocation, a city in which to live, or a mate.

What are the implications for a program? For any important student decision, a program designed for facilitating decision making may want to consider the following: the type of information required in the decision, the availability of that information, the presentation form of the information which students may need, and strategies to insure that the information is accessible at the time the decision is made. An example will demonstrate how these considerations (criteria) could apply to a common decision situation, i.e., students facing a choice among various majors. One kind of information which may be useful in this situation is the satisfaction of students already in those majors. Assume that a program conducted a survey assessing student satisfaction within available majors and summarized this information in an easy-to-read chart and distributed the chart to all students.

Is the information useful/relevant?	Potentially.
Was the information available to students without the program securing it?	No, they probably have neither the skills, the time, nor the access.
Is the information summarized in an economic fashion?	Yes, in chart form.
Will the information be accessible at the time of making the decision?	Because it cannot be assumed that so much information can be remembered (accessible when needed), the chart can be referred to as needed.

Applying these four criteria during development of programs can compensate for students' limitations to gather, process, and use information.

The decisional-conflict model (Janis & Mann, 1977) specifies three different defensive coping patterns -- indifference, hypervigilance, and defensive avoidance -- each linked dependably to a set of antecedent conditions and as set of behavorial consequences. By recognizing the behavioral manifestations of each pattern, a program may be able to intervene 1) to change the perceptions and beliefs internal to the decision maker and/or 2) to modify the external environment to better support a vigilant coping pattern. The three defensive coping patterns are discussed, in terms of ther antecedent conditions, their consequences, and implications these have for a program.

4. Programs can be designed to meet the coping pattern of indifference.

Antecedents. The authors summarize the antecedents as an individual's "...belief that no serious risks are involved from pursuing the current course or from adopting a new course of action..." (p. 205)

Consequences. They are described as:

1. Not a careful search of information.
2. Not a careful appraisal of information.
3. Unbiased indifference to supportive and non-supportive information.
4. Low level of stress (no conflict either staying with the current course of action or changing to a new course).
5. No vacillation.

Program implications According to the theory, the coping pattern of indifference may be appropriate, as with routine decisions, e.g., should

I buy mayonaise or salad dressing. However, with some major kinds of decisions one might be suspicious if an indifference pattern were manifest. If students in a decision situation having major consequences (for example, selecting a major course of study) exhibit the symptoms of the indifference coping pattern, one might wonder if the decision one made would continue to be an acceptable one as time went on or as new information were presented and assimilated.

Changes to internal perceptions and beliefs. Interventions could be directed to informing students about real and possible consequences of accepting any course of action without scrutiny. In addition, techniques to increase emotional arousal may have benefits. For example, observing the consequences to others who failed to take the decision as a consequential one, may lead students to a more thorough search and appraisal process. Janis and Mann cite a number of studies studying the facilitating and debilitating effects of strong warning appeals. They conclude that in fear arousal studies, both factors are at work, and that it is difficult to predict under what conditions and with which individuals the facilitating effects of arousal evoked by warnings are overpowered by the interfering effects.

Changes to the external environment. Perhaps the individual cannot see the importance of the decision because of factors beyond the program's control, e.g., maturity, lack of commitment to the alternatives available, etc. Whatever the reason, these individuals may at a later time see the importance of the decision and regret the decision they made. Thus, for some individuals, it may be necessary to build flexibility into the decision environment allowing trying out different alternatives and changing one's mind.

5. Programs can be designed to meet the coping pattern of hypervigilance.

Antecedents

Hypervigilance is said to arise when there is the perception of insufficient time to make a decision. While Janis and Mann cite many studies in which individuals react to conditions in a panic-like state, most of these studies observed peoples' reactions to disaster situations.

> Perhaps the relative infrequency of hypervigilant reactions is attributable to the rarity of the prime antecedent conditions that we postulate for the appearance of this pattern -- namely, awareness of imminent danger of serious loss with moderate or high hope that it can be escaped baut with a very short deadline because but apparently adequate escape routes appear to be rapidly closing off. (p. 81)

It does seem possible, however, that the perceptual state of the indi-vidual is the important factor, and what may be viewed as a small thing to one can have "disastrous" proportions to another. And without sufficient time, or the perception of it, the hypervigilance pattern many occur.

Consequences

In brief, Janis and Mann describe hypervigilance as the "...impulsive commitment to the least objectionable alternative in a state of acute anxiety about a rapidly approaching deadline" (p. 199). The consequences of hypervigilance can be summarized as involving:

1. Not a careful appraisal of information, alternatives, consequences.
2. "Active search for both supportive and non-supportive information, with failure to discriminate between relevant and irrelevant, trustworthy and untrustworthy." (p. 206)
3. Persistently high level of anxiety.

4. "Very high rate of vacillation, but occasionally practically none as a result of perseveration. (p.78)

5. Post decisional conflict over a choice is made.

One reliable consequence of this coping pattern is a large degree of what Janis and Mann describe as "postdecisional conflict" because the individual "...is likely to search frantically for a solution, persevere in his thinking about a limited number of alternatives, and then latch onto a hastily contrived solution that seems to promise immediate relief..." (p. 151). It is proposed that because of postdecisional conflict, individuals will be uneasy about their decision, and many eventually will undo or reverse it.

Program implications

Changes to internal perception and beliefs. Some individuals may be more susceptible to the hypervigilant state. Perhaps individuals who could be described as "high-anxious" as measured by trait anxiety measures are more prone to resorting to the hypervigilant pattern. This possibility, however, is little more than speculation.

Changes to the external environment. If it can be assumed that the time-pressures are in some sense "real" and not traceable to an individual's perception, then the program has some options, among them:

1. Allow more time. For example, if students are required to select a major by the beginning of their sophomore year, consideration can be gien to 1) creating an "undecided" option, which would effectively postpone the decision for selecting a major, 2) permitting students to "drop out" of school for a period of time and re-enter

when they indicate they are prepared to make a decision, and 3) changing the program so that students can postpone their final decision, for example, to the beginning of the junior year.

2. Create a program which has provisions for individuals to change their mind. Such a consideration was described earlier.

6. Programs can be designed to meet the coping pattern of defensive avoidance.

Antecedents

The determinants of the defensive avoidance reaction involve "...an awareness of serious losses from any alternative that might be selected, together with loss of hope of finding a satisfactory solution. (p. 205)

Consequences

Manifestations of the defensive avoidance coping pattern are said to include:

1. Not a thorough search for information.
2. Not a careful appraisal of information, alternatives, and consequences.
3. Passive interest or active search for supportive interest; avoidance of challenging and/or discrepant information.
4. "'Variable' from low to high (predominantly pseudo-calm, with breakthrough of high emotional arousal when signs of threat become salient)" (p. 78)
5. Little or no vacillation (except when perception of imminent threat).
6. Postdecisional conflict once a choice is made.

Defensive avoidance may take on one of three characteristic forms -- procrastination, shifting responsibility, or bolstering.

> The form of avoidance adopted depends partly on personality predispositions, but situational variables are nevertheless among the major determinants. When the two essential conditions of defensive avoidance (high conflict and loss of hope for a better solution) are present, information or advice that induces the decision maker to expect no serious penalties for postponing his decision will encourage the tendency toward defensive procrastination: he will stop thinking abut the issue, avoid discussing it with anyone who is interested in the outcome of his deliberations, and stay away from social situations where he might be put under pressure to make up his mind. But if he knows that there is a tight deadline with strong penalties for postponement, the decision maker's defensive avoidance tendencies are more likely to take the form of either shifting responsibility or bolstering. If the former, he directs his thoughts and actions toward getting others involved, rationalizing why they, not he, should make the decision and why they, not he, should take the blame if it turns out badly. If defensive avoidance takes the form of bolstering, the decision maker will continue to think and talk about the conflictful issue but will ward off stress by selective attention and distorted information processing. All three forms of defensive avoidance enable the decision maker to escape from worrying about the decision by not exposing himself to cues that evoke awareness of anticipated losses. (p. 87)

Program implications

When individuals are faced with making vital decisions, the defensive avoidance reaction "...is probably the most pervasive defective pattern as well as the most difficult to prevent or correct."

Changes to internal perceptions and beliefs. Janis and Mann refer to many types of interventions and they are difficult to summarize. Among them, though, they point out the role a counselor can play. It is suggested that the counselor "...try to counteract this pessimistic expectation in order to prevent 'defensive avoidance'."

> The counselor might encourage the client to discuss his dilemma with respected individuals in his personal network of relatives, friends, or mentors who might give him new perspectives and help him to maintain hope. He can also suggest that more information is available and tell the client where he might find it by mentioning pertinent books, pamphlets, and articles or by

> recommending professional experts who could be consulted. Above all, the decision counselor can himself convey a sense of optimism about the client's chances of finding a good solution to the problem.(p.374)

Janis and Mann belive that information can play an important role, however, it would appear that such information might be more effective if presented or available before the need to make a decision was imminent. If, in fact, "cognitive defenses are fostered by ambiguities and uncertanties in the information available to the decision maker concerning the consequences of alternative courses of actions." (p 94), the right kind of information may prevent the defensive aviodance reaction from occurring.

Changes to external environment. As was implied above, the defensive avoidance pattern may persist in a decision situation unless the hopelessness within the individual decision maker is addressed. Simple program modifications may be ineffectual.

Two considerations recommend themselves -- the same recommended to accommodate students who adopt a hypervigilant coping pattern.

1. Allow more time. Theoretically, this would serve at least two purposes. First, it would allow more time for individuals to be open to new information before the defensive avoidance pattern establishes itself and limits and biases the search. Second, if a choice is made and postdecisional conflict results, the individual, "especially if his dominant coping patterns is vigilance...will watch for an opportunity to work out a compromise solution that reduces the stress of post-decisional conflict..." As mentioned previously, a program can offer more time by creating an "undecided" option, allowing students to drop-out for a time, and changing

the timeline so students need not make the decision until later in their school career.

2. Build in a flexibility and thus accommodate individuals who change their mind. It is maintained that an individual who adopts a defensive avoidance coping pattern and then selects an alternative will not be comfortable with that choice (suffer "postdecisional conflict") which may lead to reversing the decision.

The program implications described for all three coping patterns are speculative. Most speculative are the prescriptive hypotheses for dealing with the defensive avoidance pattern. The descriptive power of the Janis and Mann's analysis, however, is persuasive. Programs would do well to consider doing "something" if students exhibit characteristics associated with each defective coping pattern. Failing to recognize manifestations of defective decision making will serve neither the student nor the program.

The next four guidelines offer some direction to practitioners as they consider how individual differences relate to vocational decision making.

7. A wide range of personalogical constructs have been investigated, however, the development of alternative interventions for different kinds of students as measured by instruments currently available is probably unwarranted.

It seems a tenable assumption that students approach vocational decision making in different ways. It is certainly true that individuals make different decisions. The research which has attempted to identify personalogical constructs which reliably relate to the processes and products of vocational decision making has not had the successes that many have speculated. Studies in the vocational decision making area have investigated a wide array of constructs, among them, conceptual level (Streufert, 1975), cognitive complexity (Bodden and Klein, 1972), vocational self-concept (O'Hara and Tiedeman, 1959), risk (Ziller, 1957), intelligence (Hollender, 1971), Holland's personality types (Cain, Gilligan and Campbell, 1978), achievement (Dilley, 1965), sex role self-concept (Moreland et al., 1979), career maturity (Super and Thompson, 1979). An effort to use differential curricula based on these constructs appears premature given the state of the art.

8. Practitioners should continue asking themselves, "What is the legitimate and appropriate role of paper-pencil inventories?"

Dolliver (1969) reviewed a number of studies which investigated the relative efficacy of expressed and inventoried measurement modes. He found that for studies examining expressed interests and inventoried interests as measured by the Strong Vocational Interest Blank, that the predictive validity of expressed interest was at least as great as the predictive validity of inventoried interests. It is conceivable, however, that not all students are able to express a choice, and for these, inventories assessing interests, values, etc. may be helpful.

Borgen and Seling (1978) examined the realtive utility of expressed and inventoried interests when both were used together to predict college major and career choice outcomes. A longitudinal design was used measuring expressed and inventoried interest among more than 600 individuals before college and three (3) years later. The following summary represents the most important outcomes.

> The total percentage of accurate expressed choice predictions was over 50% for both outcomes, while the Strong Vocational Interest Blank, Men's Form (SVIB-M) was accurate for 30.8% of all college major predictions and 40.2% of all career field forecasts. When expressed choice and the SVIB agreed in prediction of outcome, the hit rate rose to over 70%. However, when expressed choice and SVIB predictions were not the same for a given person, expressed choice was found to be 2-3 times more accurate than the SVIB-M.

Such results demonstrate that in certain situations the consistency (or alternatively, the lack of it) among inventoried and expressed interest profiles can have more predictive worth than either one by itself. The notion that "patterns" of behaviors (whether they involve scores, actions, choices, etc.) may be more useful than single behaviors has not received much research attention and may be a fruitful line of ivestigation.

9. Reliable differences between students who are decided and who are undecided about a vocational goal have not been discovered and reported. However, differential programs designed to meet the special needs of "indecisive" students may prove a most cost-effective approach.

Holland and Holland (1977) summarize the literature:

> Attempts to comprehend the vocational decisiveness of some students and the indecisiveness of others are characterized by conflicting findings, negative findings, or negligible findings. Although vocationally decided and undecided students have been assessed in many ways and with a vast range of variables (Ashby, Wall, & Osipow, 1966: Baird, 1968, 1969; Elton & Rose, 1971; Holland & nichols, 1964; Lunneborg, 1975; Nelson & Nelson, 1940; Osipow, Carney, & Barak, 1976), few clear or compelling differences emerg. Instead the most striking outcomes of these studeis are that decided and undecided high school and college students are much more alike

> than different and that the relatively few differences found are conflicting and confusing. (p. 404).

They examine the practical applications of research in the area and speculate that:

> It is probably a mistake to treat all undecided students as if they had the indecisive disposition. Only a very small percentage could be expected to have such characteristics to an incapacitating degree. In terms of the evidence, it is more reasonable to assume that most undecided students do not have any special negative characteristics and to treat them accordingly. (p. 413)

In another article, Holland (1977) contends that not all students need the same kind and same intensity of intervention. He states that the development of diagnostic measures and alternative treatments represents a direction which better serves the differential needs of students and the limited resources of programs. The chart which follows was compiled and adapted from Holland's categorization of students and the types of intervention compatible for each type.

Student type	% of student body	Student Characteristics	Type of Intervention
Decisive	50%	Do not need or want assistance	Simple, inexpensive informational materials about jobs and training.
Exoloratory	30%	Have failed to make culturally epproved decisions near the specified times.	More complex and expensive self-and-vocational-exploratory services, large group activities, tests, and inventories, courses.
Somewhat indecisive	15%	Evidence of lack of some decisive characteristics	More complex, long term and expensive small group or training experiences.
Severly indecisive	5%	Unusual difficulty in planning and training for a carreer --especially at the standard expected rate.	Some or all of the above plus long term group and/or individual vocational-personal counseling.

This categorization scheme represents but one approach to structuring an intervention program. The categories and especially the percentages should be viewed as speculative. The chart is included here to serve primarily as an example of how a differentiated program could be conceived to meet the different needs which may exist within a student body.

In a rencent study, Slaney (1980 analyzed college students' respnses to the Occupational Alterntives Question (QAQ. The QAQ measure involves only two questions and responses to these were used to divide students into four groups-- those having an occupational first choice and alterntives, a first choice plus alternatives, no first choice but alternatives, and neither a first choice nor alternatives.

> The hypothesis tested was that these groups would differ on dependent variables related to vocational decision making. No significant differences were found on socioeconomic status or on Holland's constructs of consistency, differentiation, or congruence with career choice. Significant group differences were found on congruence with college major, total number of Vocational Preference Inventory responses, and scales measuring satisfaction with college major and career choice. Significant differences were also found on two recent scales measuring vocational indecision, that is, the Vocational Decision Making Difficulty Scale and the Career Decision Scale. (p. 122)

The author concludes that the "...results suggest that expressed choice, as delineated, has a useful degree of concurrent validity with other measures of vocational indecision, in addition to its previously demonstrated predictive validity." (p. 126). This study, together withe the results previously cited, demonstrates that measurements of expressed choice represent a meaningful and useful methodology. However, unlike other studies examining expressed choice, ue of the QAQ index is used to discriminate levels of decisiveness, and therefore, this measure, or other similar measures of expressed choice, may be useful in identifying students with differential needs.

10. There is some evidence indicating that vocational decision making is influenced by developmental processes.

Brown (1970) makes this point in his review and critique of the vocational decision making literature. With the growing emphasis on career development in the early and middle school years, models like the ones described by Ginzberg et al., (1953) and Super (1957) have been widely cited. Tiedeman and O'Hara (1963) present an interesting model which hypotheses the four stages (Exploration, Crystallization, Choice, and Clarification) individuals pass through when making a vocational choice. Harren (1966) tested the assumption that individuals may be at different stages at different times. Factor analyses of college students responses to a Q-sort task yielded some support for the idea that stages such as the four in the model do exist and that they exist inthe hypotheszied sequence.

11. Given the state of the art, programs should build in mechanisms to assess the effects of intervention options.

The previous ten guidelines represent different directions for practitioners (educators, counselors, etc.) to consider as they are designing programs and dealing with students. This last guideline is a recommendation fort the way in which these guidelines and other ideas can and should be implemented they will work and work well.

The other guidelines contain or address provisions which are speculative, and thus, require further testing either in a research or evaluation mode.

Skill transfer and the degree to which problem solving skills can be generalized should be tested (Guideline 2), which means assessing skills both in the environments in which they are taught and in which they are ultimately used. Consequently, programs need to establish the means by which students' success in related and unrelated task environments is assessed, recorded and analyzed.

Similarly, Guidelines 4, 5 and 6 should not be implemented without some follow-up assessments. Even though there exists a significant amount of research to indicate that different identifiable coping patterns exist, the utility and comparative benefits of using this approach needs investigation.

In conclusion, given the state of the art in the problem solving and decision making areas, practitioners may find the "let's try it out and test it" approach the one which bears the sweetest fruit.

Reference List

Atkin, C. Instrumental utilities and information seeking. In P. Clarke (Ed.), New models for mass communication research. Beverly Hills, Cal.: Sage, 1973.

Ausubel, D. P. Educational psychology: A cognitive view. New York: Holt, Rinehart, and Winston, 1968.

Bergin, A. E. & Garfield, S. L. (Eds.). Handbook of psychotherapy and behavior change: An empirical analysis. New York: Wiley, 1971.

Bergland, B. W., Quatrano, L. A., & Lundquist, G. W. Group social models and structured interaction in teaching decision making. Vocational Guidance Quarterly, 1975, 24 (1), 28-35.

Bodden, J. L. & Klein, A. J. Cognitive complexity and appropriate vocational choice: Another look. Journal of Counseling Psychology, 1972, 19, 257-258.

Borgen, F. R. & Selling, J. Expressed and inventoried interests revisited: Perspicacity in the person. Journal of Counseling Psychology, 1978, 25 (6), 536-543.

Borgida, E. & Nisbett, R. E. The differential impact of abstract vs. concrete information on decisions. Journal of Applied Social Psychology, 1977, 7 (3), 258-271.

Bross, I. D. Design for decision. New York: Macmillan, 1953.

Brown, D. Students' vocational choices: A review and critique. New York: Houghton Mifflin Co., 1970.

Bruner J. S. On going beyond the information given presented. In Contemporary Approaches to Cognition. Cambridge, MA: Harvard University Press, 1957.

Canon, L. K. Self-confidence and selective exposure to information. In L. Festinger (Ed.), Conflict, decision and dissonance. Stanford, Cal.: Stanford University Press, 1964.

Corman, R. The effect of varying amounts and kinds of informtion as guidance in problem solving. Psychological Monographs: General and Applied, 1957, 71 (2), 1-21.

Davis, G. A. Current status of research and theory in human problem solving. Psychological Bulletin, 1966, 66, 36-54.

Davis, G. A. Psychology of problem solving: Theory and practice. New York: Basic Books, Inc., 1973.

Dilley, J. S. Decision-making ability and vocational maturity. Personnel and Guidance Journal, 165, 44, 423-427.

Dixon, D. N., Heppner, P. P., Petersen, C., & Ronning, R. R. Problem-solving workshop training. Journal of Counseling Psychology, 1979, 26 (2), 133-139.

Dolliver, R. H. Strong Vocational Interest Blank versus expressed vocational interests: A review. Psychological Bulletin, 1969, 72, 95-107.

D'Zurilla, T. J. & Goldfried, M. R. Problem Solving and behavior modification. Journal of Abnormal Psychology, 1971, 78, 107-126.

Festinger, L. A theory of cognitive dissonance. Evanston, IL: Row Peterson, 1957.

Freedman, J. L. & Sears, D. O. Selective exposure. In L. Berkowitz, (Ed.), Advances in experimental social psychology (Vol. 2). New York: Academic Press, 1965.

Gagne, R. M. The conditions of learning (2nd ed.). New York: Holt, Rinehart and Winston, 1977.

Gelatt, H.B. Information and decision theories applied to college choice and planning. Paper presented at the College Entrance Examination Board Invitational Conference on the Preparation of School Counselors, Chicago, February, 1966.

Gilligan, D.P. & Campbell, R.T. Personality, undergraduate training and occupation: An application of Holland's theory of careers. Durham, North Carolina: Duke University, 1978. (ERIC Document Reproduction Service No. ED 153 525)

Ginzberg, E., Ginsburg, S. W., Axelrad, S., & Herma, J. L. Occupational choice. New York: Columbia University Press, 1951.

Greeno, J. G. A study of problem solving. In R. Glaser (Ed.). Instructional Psychology. Hillsdale, N.J.: Lawrence Erlbaum Associates, 1978.

Greenwood, W. T. Decision theory and information systems: An introduction to management decision making. New Rochelle, NY: South-Western Publishing Co., 1969.

Harren, V. A. The vocational decision-making process among college males. Journal of Counseling Psychology, 1966, 13, 271-277.

Heppner, P. P. A review of the problem-solving literature and its relationship to the counseling process. Journal of Counseling Psychology, 1978, 25 (5), 366-375.

Holland, J. L. Promoting vocational exploration and decision making among high school and college students. School Guidance Worker, 1978, 33 (4), 21-30.

Holland, J. L. & Holland J. E. Vocational indecision: More evidence and speculation. Journal of Counseling Psychology, 1977, 24 (5), 404-414.

Hollender, J. W. Development of vocational decisions during adolescence. Journal of Counseling Psychology, 1971, 18 (3), 242-248.

Johnson, D. M., Parrott, G. R., & Stratton, R. P. Production and judgement of solutions to five problems. Journal of Educational Psychology Monograph, 1968, 59 (6), 1-21.

Klapper, J. T. The effects of the mass media. New York: Columbia University Bureau of Applied Social Research, 1949.

Kleinhesselink, R. R., & Edwards, R. E. Seeking and avoiding belief discrepant information as a function of its perceived refutability. Journal of Personality and Social Psychology, 1975, 31, 787-790.

Koberg, D. & Bagnall, J. The universal traveler: A soft-systems guide to creativity, problem-solving and the process of reaching goals. Los Altos, Cal.: William Kaufmann, Inc., 1976.

Kohler, W. The mentality of apes. New York: Harcourt Brace. 1925.

Krumboltz, J. D. & Thorensen, C. E. (Eds.). Counseling methods. New York: Holt, Reinhart & Winston, 1976.

Lanzetta, J. T. Driscoll, J. M. Effects of uncertainty and importance on information search in decision making. Journal of Personality and Social Psychology, 1968, 10 (4), 479-486.

Lowin, A. Approach and avoidance: Alternative modes of selective exposure to informtion. Journal of Personality and Social Psychology, 1967, 6, 1-9.

Maier, N. R. F. The appraisal interview: Objectives, methods, and skills. New York: John Wiley & Sons, 1958.

Maier, N. R. F. Problem solving and creativity: In individuals and groups. Belmont, Cal.: Brooks/Cole, 1970.

Miller, D. W. & Starr, M. K. The structure of human decisions. Englewood Cliffs, NJ: Prentice-Hall, 1967.

Miller, G. A. The magical number seven, plus or minus two. *Psychological Review*, 1956, *63*, 81-97.

Moreland, J. R., Harren, V. A., Krimsky, M. E. & Tinsley, H. E. Sex role self-concept and career decision making. *Journal of Counseling Psychology*, 1979, *26* (4), 329-336.

Newell, A. & Simon, H. A. *Human problem solving*. Englewood Cliffs, N.J.: Prentice-Hall, 1972.

O'Hara, R. P. & Tiedeman, D. V. Vocational self concept in adolescents. *Journal of Counseling* Psychology, 1959, *6*, 292-301.

Parnes, S. J. *Creative behavior guidebook*. New York: Scribner's, 1967.

Sears, D. O. & Abeles, R. P. Attitudes and opinions. *Annual Review of Psychology*, 1969, *20*, 253-88.

Simon, H. A. *Administrative behavior: A study of decision-making processes in administrative organization*. (3rd Ed.). New York: Free Press, 1976.

Skinner, B. F. An operant analysis of problem solving. In B. Kleinmuntz (Ed.), *Problem solving: Research, method and theory*. New York: Wiley, 1966, 222-257.

Slaney, R. B. Expressed vocational choice and vocational indecision. *Journal of Counseling Psychology*, 1980, *27* (2), 122-129.

Steve, M. Effects of rule selection training on the ability to solve problems. Presented at the American Educational Research Assoication Convention, Boston, 1980.

Streufert, D. E. Differential classroom effects upon the vocational decision-making processes of male college students grouped according to conceptual level. (Doctoral Dissertation, The University of Iowa, 1975) *Dissertation Abstracts International*, 1975, *36* 7879A-7880A. (University Microfilms No. 76-13,449.

Super, D. E. *The psychology of careers*. New York: Harper & Row, 1957.

Super, D. E. & Thompson, A. S. A six-scale, two-factor measure of adolescent career or vocational maturity. *The Vocational Guidance Quarterly*, 1979, *28* (3), 6-15.

Wilcox, J. W. *A method for measuring decision assumptions*. Cambridge, Mass.: The MIT Press, 1972.

Young, S. *Management: A systems analysis*. Glenview, IL: Scott, Foresman, 1966.

Ziller, R. C. Vocational choice and utility for risk. Journal of Counseling Psychology, 1957, 4, 61-64.

Transfer of Learning From One Setting to Another

Donald Dansereau

and

Larry W. Brooks

SECTION I: INTRODUCTION

The major purpose of this paper is to identify teaching and learning principles that facilitate the transfer of knowledge and skills from one situation to another. Of particular importance will be the implications of these principles for the technical education of the hearing impaired. Before reviewing the relevant literature, an overall framework for examining the factors that influence the efficacy of transfer will be presented.

The primary goal of education is to facilitate transfer: that is, to provide students with knowledge and skills that will lead to improved performance in subsequent situations (other courses, on the job, etc.). Unfortunately, much of the research on transfer has not been particularly informative. Voss (1978) echoes this point: "In some ways, our relatively poor understanding of transfer is amazing, since our educational systems are based fundamentally upon assumptions of transfer." (p. 14). Part of this lack of understanding may arise from inadequate analyses of the necessary and sufficient conditions for positive transfer. The prior research in this area has primarily focused on the acquisition of simple word lists and simple skills (e.g., pursuit rotor tasks). As will be pointed out later, the relevance of much of this research for complex, meaningful learning is suspect. Further, most of the transfer research has been done from a behavioristic perspective where the emphasis has been on determining input-output (stimulus-response) relationships. The role of the learner has been virtually ignored in these studies. This is unfortunate in that there is growing evidence that the prior knowledge and skills of the learner are of crucial importance in understanding and predicting both learning and performance (Bower, 1973; Dansereau, 1978; Rothkopf, 1966).

As a step toward alleviating these difficulties a framework for examining transfer is presented in Figure #1. This framework incorporates ideas from a number of authors in the transfer domain, most particularly those of Gagne and White (1978). The basis of this framework is that learning and transfer involve complex interactions between the learner (viewed as a collection of knowledge, skills, and motivations) and the characteristics of the task (e.g., types of materials and instructional manipulations). An example of the importance of examining the learner-task interaction is illustrated by the finding that individuals with high levels of knowledge and skills benefit more from trial and error learning, while individuals with lower levels of knowledge and skills benefit more from teacher-guided learning (Snow, 1977). It is further suggested that the interactions between learner and task can be compensatory in either direction (i.e., good teaching can compensate to some extent for inadequate learning skills and vice versa). In exploring these interactions it is useful to examine the nature of learner and task characteristics separately. In Figure 1 learner characteristics have been divided into two major categories: knowledge and skills that are specifically related to the content of the task at hand and knowledge and skills that are used to learn and perform in a variety of tasks regardless of content. For example, in learning how to operate a printing press, the student would bring to the situation content-specific knowledge and skills arising from previous experiences with printing presses or similar machines. The same student would also bring to the task relatively content-independent learning and problem-solving strategies that have been acquired from experiences with many types of tasks and/or from direct "strategy" instruction. The extent to which the student can use both these content-dependent and content-independent experiences in facilitating performance with the task at hand depends largely on what has been stored in the student's memory, how it has been stored, and the availability of cues for retrieval of the appropriate, stored information. In general, the content and structure of the student's memory is the major mediator between original learning and subsequent performance on a transfer task. From this perspective, the job of understanding transfer and the learning and teaching principles that facilitate it becomes largely one of determining what types of memory structures are necessary and sufficient for effective performance on a particular class of transfer tasks. Once the nature of these memory structures is determined, the next step is to delineate the teaching and learning strategies that would promote the development of these structures.

Gagne and White (1978) have identified four types of organized memory structures relevant to retention and transfer: (a) networks of propositions, (b) intellectual skills, (c) images, (d) episodes. Propositions are typically conceived of as subject-predicate constructions put together according to syntactic rules (such as those relating actors and actions, objects and attributes, actions and recipients). These may be represented by nodes containing concepts and links representing the relationships between two or more concepts. A simple example of a verbal proposition would be "For every action there is an equal and opposite reaction." Various types of propositional memory structures have been advocated by a growing number of cognitive theorists (e.g., Anderson & Bower, 1973; Bower, 1975; Rumelhart, Lindsay & Norman, 1972).

The term "intellectual skills" has been used to designate the learned memory structures that underlie the identification of concepts and the application of rules. This term has been prominently employed by Gagne (1972, 1976) to refer to the learned capability of "knowing how." In more general treatments of information processing models, intellectual skills are sometimes referred to as "action plans" or "sub-routines" (Bower, 1975). Such skills have also been described as "procedures" and "programs" by those who relate them to computer operations in artificial intelligence (Minsky, 1975; Winograd, 1972). One example of an intellectual skill might involve knowing how to make use of the proposition, "For every action there is an equal and opposite reaction," in playing a game of billiards.

Image memory structures are representations that correspond more or less directly with concrete things. Images may be visual, auditory, haptic, or some combination of these; it is generally agreed, however, that visual imagery is the most pervasive and generally useful kind. A comprehensive account of imagery and its relation to verbal processes of memory is given by Paivio (1971). Although there is substantial debate on the efficacy of imagery as a theoretical construct (Pylyshyn, 1973), its usefulness in improving the predictions of learning outcomes is well established. An example of an image structure would be a mental picture of two billiard balls colliding and obeying the action-reaction proposition.

The final memory structures identified by Gagne and White are episodes. Tulving (1972) conceived of the episode as a structure that stores information about temporally dated events and also about temporal-spatial relations among these events. A most important property of episodic memory is its "autobiographical" nature. Episodes represent events directly experienced by the learner and stored in such a way that the learner can recall that "I did such and such, in such and such a place, at such and such a time" (Tulving, 1972, p. 389). Remembering the details of a particular game of billiards that you played would be an example of retrieval from episodic memory.

As a result of their review of the relevant literature, Gagne and White proposed the model illustrated in Figure 2 as a representation of the interrelations of four different kinds of memory structures and the learning outcomes to which they may be related. These authors suggest the following:

> The model presented in this paper predicts that when knowledge is stored as a proposition or as an intellectual skill, its outcome effects in retention and transfer will be greater the more extensive are its associations with interlinked sets of propositions, intellectual skills, images, and episodes. Most of the studies reviewed in previous sections may be seen as dealing with different patterns of memory structures in learners. One treatment may have emphasized involvement in personal activity, which should encourage the formation of a stable episode, whereas another has emphasized colorful demonstrations that should lead to the formation of images.
>
> Our review indicates conflicting results in a number of instances of sets of studies addressed to the same question. The model suggests an interpretation of such discrepant results--namely, that a given treatment may not have induced the type of memory structure that was specifically intended. Laboratory-based instruction or a demonstration by the teacher may lead equally to image formation; a dramatic demonstration may give its watchers a more stable episode than a routine laboratory exercise. A picture may fail to form a retrievable image if learners are not encouraged to process the stimulus. Furthermore, an image may be ineffective for retention if instruction

> has failed to link the image with the propositions or skills it is supposed to support.
>
> For these reasons, the model implies that research investigations should include measures of the memory structures actually formed. Past studies have generally made the assumption that seeing a film, playing a simulation game, or performing a laboratory exercise, each results in the establishment of a different memory structure. Differences in learning outcome (knowledge stating or rule using) have been tested, but independent assessments of the mediating structures have not been obtained. When a difference in outcome fails to appear in such studies, it cannot be known whether the instruction itself was ineffective in establishing different memory structures, or whether the latter do indeed have differential effects. (pp. 209-210)

In summary, Gagne and White concluded that teaching and learning manipulations that lead to the formation of highly integrated, multiple memory structures (sets of propositions, intellectual skills, images and episodes) are most likely to lead to effective retention and subsequent transfer. Although the present authors agree with this conclusion, it is suggested that the existence of integrated memory structures in some cases is a necessary but not sufficient condition for effective transfer. In order for transfer to take place the individual must be able to determine from the transfer task constraints which information and skills are relevant. The individual must also be able to retrieve the relevant information and apply it correctly to the task at hand. These latter skills may be substantially content-independent and thus may be a part of the individual's repertoire of general learning and problem solving strategies. Consequently, if these skills are not available and if compensatory guidance through the transfer task is not provided by an instructor, supervisor, etc., then effective transfer will not occur. Sufficient conditions for transfer thus require the student to have integrated, content-relevant knowledge and skills as well as general, content-independent learning and problem solving skills that will allow the individual to retrieve and apply the content related information. A more detailed discussion of the nature of this stored information and teaching and learning procedures that promote its acquisition will be presented in subsequent sections.

Clearly, the difficulty involved in applying stored knowledge and skills to a new task will depend not only on the learner, per se, but also to a large extent, on the nature of the transfer task; its similarity to the original learning situation (or more directly, its compatibility with the student's stored knowledge and skills), the salience of cues for appropriate retrieval of the stored information, etc. Therefore, in understanding transfer it is necessary to examine not only the cognitive characteristics of the individual and the teaching and learning principles that produced these characteristics, but also the nature of the transfer tasks that the individual may expect to encounter.

The remainder of the paper will discuss research relevant to different types of transfer situations. To provide a framework for this discussion, a transfer classification scheme has been developed based on the notion that an individual's knowledge can be divided into two general categories: content and skills. Content knowledge consists of relevant facts, concepts, and terms associated with particular topic areas. This type of knowledge can be described as *what* an individual knows. On the other hand, skills knowledge consists of the procedures, algorithms, and activities an individual is able to perform (e.g., solving math problems and playing tennis). Skills knowledge can be thought of as those things an individual knows *how* to do. Using this basic scheme of content and skills knowledge, four general categories of transfer can be identified--content to content, skills to skills, content to skills, and skills to content (these four types of transfer and associated examples are presented in Figure 3). Within each of these categories the difficulty of transfer will be strongly influenced by the compatibility of the individual's knowledge structure with the characteristics of the transfer task. A high degree of compatibility or similarity will imply "near" transfer, while a low degree will imply "far" transfer. (For further delineation of important dimensions of transfer see Royer, 1979).

In subsequent sections the research findings related to each of the transfer categories will be presented. Finally, the paper will conclude with a presentation of the implications of this body of research for educational practices in general and for the education of the hearing impaired in particular.

SECTION II: CONTENT TO CONTENT TRANSFER

The type of transfer to be discussed in this section involves the impact of content knowledge learned in one situation on the subsequent acquisition of new content knowledge. In an educational setting this typically would consist of transfer of knowledge from one course to the next. For example, prerequisite courses are assumed to provide the learner with basic knowledge that will facilitate learning in advanced courses. This facilitation may occur in a number of ways: The "old" content knowledge may provide a general framework for embedding the more detailed "new" knowledge, the "old" knowledge may consist of facts that can flesh out a "new" framework, or the "old" knowledge may provide a convenient analogy which can guide the acquisition of the "new" knowledge.

In this section the results of traditional studies of transfer with word lists will be briefly discussed. This will be followed by a review of the research on the retention and transfer of meaningful verbal learning; task, instructional and learner variables will be discussed separately. The section will conclude with a summary of the educationally relevant principles emerging from this body of research.

Studies of Transfer Using Word Lists

The literature on learning lists of paired associates is replete with transfer studies. The primary focus of these studies has been the effects of similarity between the original and transfer lists on performance with the transfer list (for a review of the relevant literature see Postman, 1971). Numerous theoretical attempts have been made to provide a comprehensive account of transfer in terms of combined effects of stimulus and response similarity (e.g., Houston, 1964, 1966; Osgood, 1949). Although these attempts, particularly that of Osgood, have helped to summarize some transfer effects and to stimulate research, they have met with limited success. The principal difficulty encountered is that transfer, even with simple paired associate lists, is affected by many variables other than similarity. These difficulties are magnified even further when one considers using meaningful materials (e.g., descriptive texts) similar to those encountered in educational environments. As pointed out by Thorndyke (1977) in describing his research: "(The use of meaningful texts) has necessitated the definition of more complex relationships between training and target (transfer) materials, and a more complex characterization of what a subject has learned than is customary in traditional verbal learning experiments" (p. 91). The relative sterility of the paired associate and serial tasks makes it virtually impossible to draw any useful conclusions about educational practices. Consequently, in subsequent sections the emphasis will be on the retention and transfer of complex, meaningful material.

Retention and Transfer of Meaningful Verbal Learning: Task and Instructional Variables

Meaningful verbal learning typically implies the learning of text material (connected discourse). Since direct studies of transfer are relatively sparse in this domain, studies of text retention will also be included in this review, the rationale being that retention of the original learning is a necessary condition for effective transfer. Consequently, it can be generally expected that tasks and instructional manipulations that lead to good retention may also lead to good transfer. However, it should be noted that good retention is not sufficient for transfer, and, further, the way the information is retained (e.g., how it is organized in memory) may be just as important as the amount retained. With these disclaimers in mind the salient literature will be presented under four subsections related to manipulations of content, organization, supplementary material and instructional methods.

Content. Instructional materials can vary with respect to comprehensibility (readability), familiarity, and concreteness. The large body of research on the readability of text has been extensively reviewed by Klare (1963) and Carroll (Note 1). Most of the published readability formulae involve objective measures of vocabulary and syntax. One notable exception to this is the cloze technique (Taylor, 1953). In this technique every nth word is deleted and a group of subjects at a particular reading level is asked to fill in the deleted words. The average number of words correctly filled in is used as the index of readability; the greater the number of correct words generated, the more readable the text. Bormuth (1966) claims that using this measure in conjunction with other readability formulae produces multiple correlation coefficients with measures of comprehension and retention of between .85 and .95. Given this level of predictability, it seems very reasonable for educators to select or create instructional materials that have a high degree of readability as measured by these techniques.

With regard to the familiarity of the content, a substantial amount of recent research under the rubric of schema theory has suggested that the amount and form of the relevant background knowledge an individual brings to the instructional setting strongly influence what and how much is learned from the instructional materials (for reviews of this research, see Munro & Rigney, 1977 and Anderson, Spiro & Anderson, 1977). It appears as if text information is interpreted, organized, and retrieved in terms of high-level schemata or systems of placeholders. It follows that the student who does not possess relevant schemata is going to have trouble learning and remembering the information encountered in stories and textbooks. There are a number of things educators can do to alleviate this problem. As Thorndyke (1977) suggests:

> One might, for example, teach a subject domain in a top-down hierarchical fashion, by making explicit during initial exposures the general form or structural characteristics of the material to be presented, and by gradually increasing the degree of detail and specificity. Thus, initial learning would consist of acquisition of the appropriate general structure (schema), while subsequent learning would require the acquisition of detailed facts to fill out the overall organizational framework. This presentation strategy has been termed "web teaching" (Norman, 1973). (p. 97).

In addition to assisting the student in establishing relevant schemata, the instructor can facilitate the activation of already existing schemata by providing appropriate cues and bridging materials. A discussion of these forms of advance organizers will be presented under the section entitled Supplementary Materials.

Instructional content can also vary in terms of concreteness. Many studies of paired associate learning have demonstrated that concrete words in lists of paired associates are learned faster than abstract words, and that picture pairs are learned faster than their corresponding word pairs (Paivio, 1971). These findings of superior recall of imageable material has been extended to prose. Montague and Carter (1973) obtained superior immediate recall of more vivid (concrete) passages than of less vivid passages by college students. Johnson (1974) found that idea units rated high on concreteness were recalled better both immediately and after a seven-day delay and that there was no interaction of concreteness and retention interval. Further, Royer and Cable (1974) have shown that concrete, easily understood material leads to positive transfer in the learning of more difficult, abstract material.

Despite the generous use of pictures and illustrations in textbooks, little systematic study of the interactive effects of pictures and text on learning and retention has been conducted. Dwyer (1967) found an advantage of abstract, schematic line drawings in the teaching of anatomy, whereas realistic pictures were no better than strictly verbal presentations. Fredrick

(Note 2) found students learned grammatical principles better from symbolic representations (tree diagrams of syntactical representations) than from verbal statements. Stromnes and Nyman (1974) found superior recall of information at both immediate and one year intervals from a passage supported by a picture than from the same passage without a picture. Although the research indicates pictures do seem to help, further studies are needed to determine what kinds of pictorial representations enhance the transmission of information, and under what circumstances.

Given the data cited above, it is clear that educators should attempt to select or develop concrete instructional materials that are liberally supported by pictures and illustrations and, where possible, to use such materials as precursors to learning more complex, abstract information.

Organization (Structure). Instructional materials must be presented in some sequence, and indeed this is usually one of the first problems instructors encounter when planning a course of instruction. The problem the instructor faces is that most bodies of information are not clearly organized into a simple sequence. Rather, there are interlocking relationships such that any concept must be considered in relation to several others. Yet language permits the statement of such relationships only one at a time; consequently, a decision must be made as to which relationship is stated first, second, and so on.

After an extensive review of the literature, Dansereau, Evans, Wright, Long, and Actkinson (1974) reached three conclusions regarding the sequencing of material. First, although the results are mixed, there is apparently an effect of sequencing on comprehension and retention of academic-like material. Second, except for very specific types of material, there have been very few techniques developed which would provide optimal or near optimal sequences. Third, the lack of attention to individual differences in academic aptitude has undoubtedly led to the masking of sequencing effects.

On the basis of these conclusions it is clear that further effort should be directed toward the development of technologies for generating sequences and subsequent assessments of the effectiveness of these generated sequences with different bodies of material and with students differing in academic aptitude. As a first step in this direction, Dansereau, Long, Evans, and Actkinson (1980) used multidimensional scaling (MDS) as a methodology for creating a composite organizational structure of a set of concepts using the similarity judgements of a number of experts. Systematic algorithms were then employed for sequencing the concepts. The results of this study were promising in that MDS-generated instructional sequences led to higher levels of performance in the learning of technical information.

Along a similar line, there have been a number of attempts to develop procedures for specifying the structure of existing texts. These attempts fall under the rubric of text grammars (Meyer, 1975; Rumelhart, 1975; Van Dijk & Kintsch, 1977). Results of experiments using text grammars to specify relationships have indicated that superordinate propositions (those appearing at high levels in the text hierarchy) are better retained, especially at increased retention intervals, than subordinate propositions (these are defined as propositions whose arguments had previously occurred in other propositions). (See Kintsch, Kosminsky, Streby, McKoon, & Keenan, 1975; Meyer, 1975). Also, Thorndyke (1977) has shown that presenting two successive text passages with the same structure and differnt content leads to improved learning of the second passage. Apparently the structure acquired by the student from the first passage facilitates the learning of the new information in the second passage.

One educational implication arising from the research on organization and structure is that multi-dimensional scaling, as well as other forms of specifying relationships between concepts, may be potentially useful in developing optimal instructional sequences. A second implication, based on the work of Thorndyke (1977), is that the structures of text material should be standardized as much as possible and, where practical, the nature of such structures should be brought to the attention of the students. This latter point will be expanded in a subsequent section on learner variables.

Supplementary Materials. In addition to the primary instructional materials, a number of types of supplementary materials have been proposed as potential aids to learning, retention, and transfer. These include advance organizers, behavioral objectives and inserted questions. Ausubel (1963,

1968) proposed that a reader's abstract cognitive structures provide the "ideational scaffolding" for the detailed information contained in text. In his words (1968, p. 153), "...new ideas and information are learned and retained most efficiently when inclusive and specifically relevant ideas are already available in cognitive structure to serve a subsuming role or to furnish ideational anchorage." In line with this theoretical perspective, Ausubel has proposed the concept of advance organizers. According to Ausubel (1978), advance organizers are introductory material at a higher level of abstraction, generality, and inclusiveness than the learning passage itself and are relateable to presumed ideational content in the learner's current cognitive structure. In some ways advance organizers can be thought of as attempts at "bridging" the gap between a learner's prior knowledge and the present learning materials. To date, the research on advance organizers has been somewhat equivocal. Some studies have obtained positive effects (e.g., Mayer, 1976) and others have found no differences due to organizers (e.g., DeCaro, 1977). For reviews and discussions of this research see Barnes and Clawson (1975), Hartley and Davis (1976), Lawton and Wanska (1977), Ausubel (1978), and Mayer (1979). The root of this equivocality seems to be the vagueness of the definition of advance organizers. There are no specified rules for constructing these types of materials. Consequently, their potential effectiveness varies with the cleverness of the instructional designer. Given this situation, the existence of a number of published reports on the positive impact of advance organizers coupled with the lack of direct negative effects (see the above-mentioned reviews for examples) provides support for the efficacy of this approach. Of particular importance for transfer is the work of Mayer (1976). He found that subjects given an advance organizer in the form of pretraining with a concrete model of the computer before learning performed better on novel (far) transfer and about the same on near transfer relative to no-pretraining subjects, including subjects who were given posttraining with the same model after learning. He suggests that the concrete model served as an advance organizer which provided subjects with a meaningful learning set to which new information could be assimilated. Those subjects who did not receive the model were apparently encouraged to build narrower outcomes by adding the new technical information to their memories in the form presented. The import of Mayer's study is that advance organizer material may be effective in promoting delayed retention and far transfer, and consequently should be used in settings where these effects are desirable. In another study, Mayer (1978) found that low ability subjects given an organizer prior to reading performed better on questions that required integrating across different paragraphs of the presented text, and subjects given the organizer after reading performed relatively better on questions concerning information that they had read within the same paragraph. Apparently the advance organizer used in this study served as an integrating context to which new, incoming information could be assimilated. When the test questions reflect the presentation organization, an advance organizer apparently has little positive effect; however, when the material is presented in an order that is inconsistent with the posttest questions, then advance organizers seem to have a facilitative effect. Since this latter situation is more likely to arise in most real world educational settings, it seems highly advisable for educators to devote considerable effort to the development of appropriate advance organizers. According to Ausubel's (1968) subsumption theory and Mayer's (1975) assimilation encoding theory, advance organizers may be especially important for the learning of technical, unfamiliar, or poorly organized material because they serve the following functions: (a) availability--a meaningful context is provided to which new material may be assimilated. For example, Ausubel (1968, p. 148) has argued that meaningful learning requires having relevant "ideas already available in cognitive structure" and for advance organizers to provide these "anchoring ideas or subsumers", the advance organizer must be "presented at a higher level of abstraction, generality, or inclusiveness." (b) Activation--advance organizers may serve to encourage an encoding strategy in which the learner attempts to integrate incoming information with the meaningful context. In this regard, Ausubel and Fitzgerald (1961, p. 266) have used the term "discriminability" to refer to the role of an organizer to "delineate clearly, precisely, and explicitly the principal similarities and differences between the new learning passage...and existing related concepts in cognitive structure." Ausubel (1968) and his colleagues (Ausubel & Fitzgerald, 1961) have suggested using an "expository organizer" when no anchoring ideas are available to the learner and using a "comparative organizer" when anchoring ideas are available.

The concept of advance organizers can be thought of as a subset of a broader, more basic theoretical framework labeled "schema" theory. Schemata are abstract knowledge structures whose elements are other schemata and slots, placeholders, or variables which can take on a restricted range of values (Minsky, 1975; Rumelhart & Ortony, 1977; Schank & Abelson, 1975). A schema is structured in the sense that it indicates typical relationships among component elements. In the simplest case the reader or listener will have a preformed schema adequate to subsume (Ausubel, 1963) a text. The encoded representation of such a text will consist of the subsuming schema in which the slots have been assigned specific values; that is, are instantiated (Anderson, Pichert, Goetz, Schallert, Stevens, & Trollip, 1976) with the particular information in the message. A person will have the subjective sense that a passage has been comprehended when there is a good match between the information presented and the slots in the schema.

The learner uses two general kinds of schemata in interpreting text. The first embodies knowledge of discourse conventions that signal organization. These are probably specialized conventions characteristic of distinct text forms as well as conventions common to most forms; thus, it is possible to speak of a story schema, a personal letter schema, a news article schema, a scientific report schema, and so on. As a class, knowledge of the discourse-level conventions of text may be called textual schema. Very little research has been conducted with these types of schemata; one notable exception which will be taken up in a later section is a recent study by Brooks and Dansereau (1980).

The majority of prior research has been concerned with a second general type of schemata, namely content schemata, embodying the learner's existing knowledge of real and imaginary worlds. What the learner already knows and believes about a topic helps to structure the interpretation of new messages about this topic. A variety of experimental techniques has been employed to study the effects of schemata. For instance, titles have been provided that induce different interpretations of ambiguous passages (Bransford & Johnson, 1973; Schallert, 1976). Or, characters in the passage to be read have been assigned the names of well-known figures, thereby insinuating the relevance of the learner's existing knowledge of these individuals (Sulin & Dooling, 1974; Brown, Smiley, Day, Townsend, & Lawton, 1977). Or alternate introductions to the passages have been written so as to cause learners to identify with different characters (Owens, Dafoe, & Bower, 1979). Or, schemata have been manipulated by selecting subjects with different amounts of knowledge about a topic or different cultural backgrounds (Anderson, Reynolds, Schallert, & Goetz, 1977; Spillich, Vesonder, Chiesl, & Voss, 1979; Steffenson, Jogdeo, & Anderson, 1978).

Two clear findings have emerged from this research. First, learners make inferences conssitent with their schemata. Second, they recall more text information important to their schemata. Although this research has been useful in demonstrating the importance of the interaction of an individual's memory structure with the text to be learned, the focus of this research has been almost exclusively on narrative discourse (i.e., stories). This is unfortunate in that the type of schema that are useful in understanding and recalling narrative prose may not be directly generalizable to many types of academic materials where the individual does not have a stored set of directly relevant experiences. In these situations it would appear that more abstract or textual schemata would be of greater importance. In particular, the processing of academic material should be facilitated by form schemata which specify the set of categories of information a well-informed learner should know about a particular topic. Unfortunately very little research has been directed toward this aspect of schema theory. The one study in this domain, Brooks and Dansereau (Note 3), will be discussed in a subsequent section.

Behavioral objectives are another type of supplementary material that have been used to promote learning, retention and transfer. These are statements provided to the learner about what should be achieved as a result of the learning experience. Those such as Gagne (1967), Glaser (1967), and Mager (1968) who support the use of behavioral objectives typically claim that behavioral objectives clearly indicate to students what is required of them, and as a result relevant learning is enhanced. Those such as Atkin (1968), Eisner (1967), and Raths (1971) who express reservations about behavioral objectives suggest that they discourage students from expanding their horizons by encouraging them to confine their learning to specified objectives, and as a result incidental learning is depressed Unfortunately, much of the dialogue concerning the strengths and weaknesses of behavioral objectives fails to distinguish between hypothetical claims and empirically substantiated knowledge. Melton (1978), in a review of the literature, concludes the following: "From this review it is clear that a variety of complex conditions determine whether or not behavioral objectives enhance relevant learning and depress or enhance incidental learning...Much effort has been wasted in attempting to find a simple, universal answer as to whether behavioral objectives should or should not be used, and an alternative approach is required. It is suggested that this should be one that treats behavioral objectives simply as one of several tools available to educators, with research directed toward determining not only their advantages and limitations, but also the conditions under which they can be used most effectively." (p. 299). Given the uncertain state of the research findings concerning behavioral objectives it is difficult (at this time) to make a positive or negative recommendation concerning their implementation in educational settings.

Adjunct questions are conceptually related to behavioral objectives but have received substantially more research attention. Typically, one or two adjunct questions are inserted either before (prequestions) or after (postquestions) a segment of text. After reading the passage, examination is then made of the amount of questioned (intentional) and nonquestioned (incidental) passage material retained by the learners. The typical finding in studies of this sort (see Anderson & Biddle, 1975, and Rickards, 1979, for reviews) is that the prequestion group retains roughly the same amount of material directly questioned as the postquestion group, and that both adjunct question groups retain more of the questioned material than a reading-only control group. This has been called the "direct instructive effect" (Rothkopf, 1966). More important, adjunct question studies have generally demonstrated that a postquestion group produces more recall of material not actually questioned than a prequestion group or a reading-only control condition. It is this so-called "mathemagenic" (Rothkopf, 1965) effect or "indirect effect" (Anderson & Biddle, 1975) which has received the greater degree of empirical attention (see Hartley & Davies, 1976, and Rickards & Denner, 1978, for reviews).

Of particular importance in this domain is the research on the use of different types of adjunct questions. Table 1 (from Andre, 1979) illustrates the major types that have been explored. Andre (1979), in an extensive review of this literature, concludes that higher level questions (those above the factual level, see Table 1) have facilitative effects on both reproductive and productive knowledge, but that the conditions under which such facilitation occurs are not well understood.

With regard to transfer, a number of studies suggest that when students are given adjunct application questions (see Table 1) about concepts and principles, as compared to adjunct factual questions, their ability to use knowledge of the concepts and principles to recognize new examples or solve problems involving the concepts and principles is enhanced (Watts & Anderson, 1971; Dapra & Felker, Note 4). The effects of the questions appear to be specific to the concepts and principles asked about in the adjunct questions; the acquisition of other concepts and principles discussed is not facilitated (Shavelson, Berliner, Ravitch, & Loeding, 1974; McKonkie, Rainer, & Wilson, 1973).

There are also a number of additional studies using high level questions that appear to have direct educational implications. For example, Anderson, Anderson, Dalgaard, Paden, Biddle, Surber, & Alessi (1975) found that cognitively high level adjunct questions significantly enhanced performance in an economics course when presented as part of a computer assisted instruction program. Moreover, research by Rickards and Hatcher (1978) has demonstrated that the insertion of high level adjunct questions significantly enhanced the performance of poor "comprehenders," i.e., readers whose vocabulary level was average or above, but whose comprehension subtest score in a reading achievement test was one year or more below average. Given this information, applied researchers might well further explore the use of adjunct questions in computer assisted instruction settings or, perhaps, as a remedial reading technique employing a transfer of learning design.

In summary, the results of the adjunct question studies strongly indicate that high level post questions be included with primary instructional materials.

Instructional Methods. A large variety of instructional methods has been implemented and assessed (e.g., programmed learning, computer assisted instruction, lecture, discussions). Unfortunately the results of these assessments have been largely equivocal. Dubin & Taveggia (1968) in an extensive review of the educational literature, conclude that there appears to be no difference among truly distinctive methods of college instruction when evaluated by student performance on final examinations. More specific instances of this equivocality have been pointed out by Carroll (Note 1) and Dansereau (19[illegible]8).

Most of the studies assessing instructional methods have not looked at the interaction of instructional methods with other variables such as individual differences and type of assessment. This is unfortunate in that the few studies examining interactions have produced some interesting results. For example, it has been typically found that discovery (trial and error) learning methods produce better "far" transfer to novel situations while expository (guided) learning methods produce better "near" transfer (Mayer, 1975). Further, with regard to individual difference interactions, it has been found that field independent individuals (those who can locate a simple figure in a more complex field) benefit more from discovery learning situations while field dependent individuals (those who have difficulty locating simple figures within more complex ones) benefit more from expository or guided learning conditions (McLeod & Adams, 1979). Clearly, these types of interactions would seem to mask main effects in studies that did not include these additional variables.

The evidence from the research on different instructional methods would suggest that an omnibus approach to instruction is ill-advised. Rather, instructional methods should be tailored to fit the desired learning outcomes and the individual aptitudes, styles, and preferences of the learners. Further information on approaches to matching instruction to individual differences has been provided by Hunt (1977) and Snow, Shuell, and Marshalek (Note 5). This topic area will be elaborated in the next section.

Retention and Transfer of Meaningful Verbal Learning: Learner Variables

This section contains a presentation of a variety of individual difference variables that have been related to learning outcomes. Where appropriate the potential interaction of these variables with instructional and task variables will be discussed.

Intellectual factors. One important intellectual factor is conceptual or integrative complexity. This factor is defined as: "The extent to which dimensional units of information can be interrelated in different ways in order to generate new and discrepant perspectives about stimuli" (Schroder, Driver, & Streufert, 1967, p. 25). This aptitude or capacity has been measured by a variety of techniques. For example, subjects are asked to complete a passage on some academic topic. Expert raters then analyze the subject's output for the following type of evidence: inability to generate conflict or diversity, inability to view a situation from another person's point of view and see it in relation to one's own, inability to generate alternate perceptions and outcomes, tendency to seek structure, avoid delay, to close fast, etc. Persons with the above tendencies are rated "concrete" or "simple"; persons with opposite tendencies are rated "abstract" or "complex."

Schroder, Driver, and Streufert (1967) have also measured conceptual complexity in a multidimensional scaling task. In this situation a multivariate technique is used to abstract a subject's conceptual space from his similarity judgments of all possible pairs of stimuli (for example, semantic concepts). The more a conceptual space contains dimensions of information that are not objectively or directly given by the situation, the more "abstract" or "complex" the individual. The "concrete" or "simple" person is considered to be more "stimulus bound." Also, according to the above authors, more balanced use of dimensions indicates a more "abstract" individual.

In tactical simulation games, conceptually complex people apparently develop higher level strategies than simple persons no matter what the level of environmental complexity (Streufert, Clardy, Driver, Karlins, Schroder, & Suedfeld, 1965; and Driver, Note 6).

Claunch (1964) compared the examination performance of "concrete" (simple) and "abstract" (Complex) students (holding

Scholastic Aptitude Test scores constant) in an introductory course on personality. On objective questions, "abstract" and "concrete" individuals scored equally well, while on essay questions, "abstract" persons performed at a significantly higher level.

Along a similar line, Suedfeld and Hagen (1966) showed that high conceptual level subjects were better than conceptually simple subjects at solving complex verbal problems, but not at solving simple ones.

"Complex" and "simple" individuals were asked to identify an indistinct or unstructured stimulus pattern and their predecision information processes were assessed. Structurally complex Ss generated more alternative responses and made greater differentiating, encoding, and inferring responses (Sieber & Lanzetta, 1966; Saloman, Note 7).

Conceptual complexity, which exhibits correlations ranging from .12 to .50 with IQ, appears to be a potentially potent factor in determining the types of learning and problem solving strategies which can effectively be used by an individual. Obviously, learning methods requiring rapid integration of a diverse set of materials would be extremely difficult for a conceptually "simple" individual to employ. Conversely, "complex" students may become bored with simple tasks and strategies.

The Structure of Intellect model (Guilford & Hoepfner, 1971) provides a good framework for discussing component learning skills. In this model, five intellectual "operations" have been identified by factor analysis of a large variety of paper and pencil tasks. These operations and their corresponding descriptions are as follows:

(a) Cognition -- Immediate discovery, awareness, rediscovery, or recognition of information in its various forms, comprehension or understanding.

(b) Memory -- Fixation of newly gained information in storage.

(c) Divergent production -- Generation of logical alternatives from given information, where emphasis is upon variety and quantity.

(d) Convergent production -- Generation of logical conclusions from given information, where emphasis is upon achieving unique or conventionally best outcomes.

(e) Evaluation -- Comparisons of items of information in terms of variables and making judgments concerning criterion satisfaction.

Prior empirical work has shown that ability to perform the Structure of Intellect operations strongly relates to achievement in ninth grade math (Guilford, Hoepfner, & Peterson, 1965; and Guilford & Hoepfner, 1971), tenth grade geometry (Caldwell, Schroder, Michael, & Meyers, 1970), advanced calculus (Hills, 1957), and concept learning (Dunham, Guilford & Hoepfner, 1968).

In a more general sense it should be noted that intellectual aptitude of the learners may strongly influence the apparent effectiveness of various instructional methods. For example, Snow (1977) suggests the following:

> ...in conventional lecture-demonstration instruction in science, one will usually find a moderate correlation between mental ability at the start and achievement at the end. If one makes the instruction more inquiry-oriented, the ability-achievement correlation will usually go up. That is, higher ability students do better and lower ability students do less well, relative to conventional conditions. If, on the other hand, the instruction makes increased use of physical models and simplified, clear-cut demonstrations, the ability-achievement correlation may often go down; here, lower ability students do better and higher ability students do less well, relative to their performance in conventional conditions. This sort of result has led to the hypothesis that increasing the information processing burdens in instruction allows high [ability] students to capitalize on their ability, while overtaxing the lower ability students. Removing some of these burdens compensates for low [ability] students' weaknesses. In effect, the treatment must be made to do for these latter students what they cannot do for themselves, at least temporarily. This helps lower ability students but fails to stretch higher ability students and in the extreme bores them or interferes with their idiosyncratic processes. Such phenomena are ubiquitous in education, but they are not at all well understood. Obtaining such understanding requires process analyses of both aptitudes and instructional situations. (pp. 5-6).

Personality Variables. Rokeach (1960) implied that highly dogmatic learners (as measured by a paper and pencil test on dogmatism) would presumably reject new belief systems because of the threat such individuals associate with beliefs which differ from their existing cognitive systems. They, more than others, would probably avoid discrepant or novel information. On the other hand, low dogmatic learners would presumably experience no such threat and would, accordingly, be open to novel information. Experimentation on this issue has shown that high dogmatics make more errors than low dogmatics in learning "belief incongruent" associates (for example, ball-square) but excel in the acquisition of "belief congruent" pairs such as ball-round (Adams & Vidulich, 1962). Along similar lines, Kleck and Wheaton (1967) found that high dogmatics recalled less information which disagreed with their existing beliefs than low dogmatics.

The concept of Internal versus External control of reinforcement, introduced by Rotter (1966), refers to the degree of control the person judges that he/she has over his/her environment. The person at the "internal" end of the continuum perceives outcomes to be a consequence of his/her own actions. The person at the "external" pole believes that outcomes are due to fate, luck, and powerful others, and, therefore, are beyond his/her personal control. "Internals" more actively seek information relevant to problem solving than "externals" (Davis & Phares, 1967). "Internals" tend to retain more information when this information is relevant to personal goals (Seeman,

& Evans, 1962). And "Internals" tend to better utilize information that has been equivalently acquired and retained by internals and externals (Phares, 1968). Julian and Katz (1968) using a synonym/antonym word-pair identification task showed that "internals" spend more time on difficult items than on easy ones, while externals' decision times are not related to item difficulty.

In an extensive review, Coleman, Campbell, Hobson, McPartland, Mood, Weinfeld, and York (1966), found that sense of control over the environment was the best single predictor of Black students' academic achievement. It is interesting to note in this regard that Internal-External control is virtually unrelated to IQ (Hersch & Scheibe, 1967; Rotter, 1966).

Cognitive styles. Cognitive styles, in many cases, appear to mediate between personality characteristics and aptitudes on one hand, and concrete learning and problem solving strategies on the other. Cognitive styles have been defined by Witkin, Oltman, Cox, Ehrlichman, Hamm, & Ringler (Note 8) as: "Characteristic modes of functioning that we show throughout our perceptual and intellectual activities in a highly consistent and pervasive way (p. 2)," and by Kagan, Moss, and Sigel (1963) as: "Stable individual preferences in the mode of perceptual organization and conceptual categorization of the external environment (p. 74)." As can be seen from the above definitions, cognitive styles act more or less as meta-strategies, and as such create definite boundaries on the types of specific strategies available or potentially available to individuals. Examples of specific cognit styles and their relationship to educationally relevant variables will be presented next.

A number of studies (Gardner, 1953; Bruner, Goodnow, & Austin, 1956) have demonstrated that individuals tend to use relatively constant category widths in the classification of objects and events. Pettigrew (1958) developed a Category Width Scale which has been positively correlated with breadth of stimulus generalization (Wallach & Caron, 1959), and negatively related to the recall of human faces in an incidental learning task (Messick & Damarin, 1964). High scorers (large category width) make more accurate perceptual judgments under normal conditions but not under distracting conditions (Bieri, 1969).

Kagan, Moss, and Sigel (1963) have identified three style categories based on the subjects' grouping of common pictorial stimuli. In using a descriptive-analytic style the individual tends to prefer to split these environmental stimuli into discrete entities and to respond to them as separate units. When analytic individuals are required to group stimuli for purposes of categorization, they tend to base their groupings on objective attributes shared by all of the stimuli. The inferential-categorical style is typified by a grouping of the stimuli which are categorized together. The relational-contextual response is based on a preference by the subject toward categorizing stimuli on the basis of functional or thematic relationships which may occur among these objects.

Generally these last two categories are combined to form a "non-analytic" category, thus producing a bi-categorical system: analytic style versus nonanalytic style. Sigel (1967) has constructed a paper and pencil test for tapping these two styles. Subjects who have been found to be analytic appear to attend to more factual detail in concept acquisition (Kagan et al., 1963), are superior to nonanalytics in learning concepts based on objective similarity of detail among visual stimuli (Lee, Kagan, & Rabson, 1963), and score higher on performance tests than verbal tests (Kagan, Rosman, Day, Albert, & Phillips, 1964). Conversely, nonanalytics score better on verbal tests than performance tests; learn functional relationships better than analytics; and tend to be more impulsive than analytics on tests of cognitive control (Kagan et al., 1963; Kagan et al., 1964). There does not, however, appear to be a significant difference between these two style categories in terms of IQ.

Beller (Note 9) has demonstrated that a specific teaching method can be designed to facilitate the learning of children in associating words with objects when the cognitive styles (analytic versus nonanalytic) of these children are identified and used to assign the children to teaching methods which are consonant with their stylistic preferences.

On the other side of the coin, Scott and Sigel (Note 10) showed that inquiry versus expository teaching methods used in grades 4, 5, and 6 actually influenced responses on the Sigel Cognitive Style Test (1967), thus indicating that the analytic-nonanalytic styles are somewhat modifiable.

The notion of field dependence and field independence was originally developed by Witkin and his colleagues (Witkin, Dyk, Faterson, Goodenough, & Karp, 1962; Witkin, Lewis, Hertzman, Machover, Meissner, & Wapner, 1954). The Rod and Frame Test (RFT), in which the subject is required to directly or indirectly adjust a movable rod to the true vertical position while the rod itself is located in a separately tilted frame, and the Embedded Figures Test (EFT), in which the individual must detect simple geometrical figures contained within much more complex figures, have been used to assess field dependence. The more difficulty an individual has on the above two tasks the greater is his field dependence Witkin and his colleagues (1967) have shown the invariance of the EFT and RFT scores under a variety of natural (for example, age, marriage, divorce) and experimental (for example, drugs, ECS, hypnosis) conditions.

Kennedy (1972) found that field independence (FI) was related to success in aviation training for both pilots and non-pilots. These findings are consistent with a number of other studies that reported superior performance by field independents on various pilot simulating, pilot related, or pilot selective tasks (Benfari & Vitale, 1965; Thornton et al., 1968; Barrett & Thornton, 1968; Crutchfield et al., 1958). In addition, engineers have been found to be more FI than a general college sample (Barrett & Thornton, 1967), while students majoring in liberal arts are more field dependent (FD) than those majoring in physics, math, and chemistry (DeRussey & Futch, 1971). It also appears that children with learning difficulties generally tend to be field dependent (Keogh &

Donlon, 1972; Bruininks, 1969; Stuart, 1967). Finally, Parasnis and Long (1979) found that hearing impaired students tend to be more field dependent than their normally hearing peers.

A few attempts have been made to match field dependent/independent styles with teaching method. Hester and Tagatz (1971) used a measure highly correlated with the EFT to assess analytic (FI) and global (FD) cognitive styles. They then instructed their *S*s in two concept attainment strategies: "Commonality" (determining attributes common to correct instances) and "Conservative" (comparing negative and positive instances to find differences). *S*s displaying analytic (FI) styles apparently could use either strategy effectively, while *S*s displaying a global (FD) style were able to use the commonality strategy but not the conservative strategy. In another study, Grieve and Davis (1971) tested Analytic (FI) and Global (FD) subjects after 11 hours of geography using two methods of instruction (expository and discovery). They found Analytic (FI) *S*s did generally better than Globals (FD) and that there was no aptitude treatment interaction. However, more recent studies have suggested that FIs learn more effectively with a discovery approach while FDs learn better with an expository approach (e.g., McLeod & Adams, 1979). More generally, research has indicated significant differences between field-dependent and field-independent individuals with regard to the teaching-learning process. As examples, field dependent individuals tend to be better at learning and remembering incidental social material (Eagle, Goldberger, & Breitman, 1969), are more affected by external reinforcement in the form of praise or criticism (Ferrell, 1971; Konstadt & Forman, 1965), and are more likely to have difficulty with relatively unstructured material (Renzi, 1974) than field-independent individuals. Amplifying these ideas, Wittrock (1979) suggests that the field dependence/independence dimension can be used as an index of the extent to which students will benefit from a structured vs. a more permissive environment. According to Wittrock, field-independent students learn better from a situation in which they are permitted to set their own goals, provide their own motivation, and determine their own reinforcement. Field-dependent students are more comfortable and learn better with externally defined goals, external reinforcement, and a clearly delineated structure.

Indirect evidence that instructional/communication approaches can be tailored to styles comes from studies in a therapeutic setting. Witkin, Lewis, and Weil (1968) found that therapists, regardless of their cognitive style, took a significantly more directive role with their field-dependent clients than with their field-independent clients. The therapists also tended to ask more questions answerable with a simple yes or no of their field-dependent clients, while asking more open-ended questions of their field-independent clients. The therapists thus seemed to be adjusting to the need for structuring based on their clients' cognitive styles. This adjustment seemed to take place automatically based on cues picked up in interaction with the client.

The results led Witkin, Moore, Goodenough, and Cox (Note 11) to ask "whether by sensitizing teachers to the implications of their own styles and the styles of their students for the teaching-learning process, we may increase the adaptibility of teachers." (p. 50). A study by Doebler and Eicke (1979) attempted to partially answer this question with fifth-grade students. Teachers in the "experimental" schools were made aware of the educational implications of the field-dependence/independence dimension of cognitive style, the individual styles of their students and their own styles. Teachers in the "control" school received no information. Measures of self-concept and attitude toward school were administered prior to teacher training and again at the conclusion of the experiment to all students. Analyses of covariance indicated significantly higher posttest scores in the "experimental" schools on both the self-concept and attitude toward school measures.

The examples presented above provide clear evidence as to the relatively strong relationship between cognitive style variables and academic attitudes and behaviors. These styles or meta-strategies deserve even further consideration in the tailoring of instructional methods to individuals.

Reception preferences. At a somewhat more specific level than cognitive styles, individuals have preferences for receiving information in certain ways. As with styles, these preferences should influence the strategies available to a student and the effectiveness with which he/she applies them. Depending on their potency, these preferences will either limit which strategies can be taught to an individual or will themselves be modified by strategy training procedures.

Hartnett (1973) assessed four dimensions of learning style preference in 2,175 Ss. These dimensions were:

(a) Preference for regular classwork versus independent study.

(b) Preference for objective versus essay examinations.

(c) Preference for lectures versus discussion.

(d) Like versus dislike of doing individual research.

As a result of this assessment study, Hartnett found the following:

On entering college, students generally preferred regular classwork, objective exams, discussions, and were equally divided on attitude toward individual research.

"Bright" entering students (as measured by Scholastic Aptitude Test scores and high school grade point averages) preferred regular classwork, objective exams, lectures, and individual research.

During the first two years of college, trends in preference generally were from assigned to independent study, objective exams to essay exams, discussion to lectures, and toward more individual research.

However, though there was a steady move toward preferences for less traditional styles during the first two years of college, it appeared to be the less able students whose learning style preferences were drifting in this direction. Although there were relationships between preferences and academic performances, it is not clear whether learning style preferences are a cause or an effect of course grades. Obviously, further research on this issue is needed.

If learning style preference proves to be a viable educational variable, then matching of instruction to preference would probably be beneficial. If such matching is impossible or ineffective, perhaps the teaching of effective strategies for dealing with non-preferred instructional methods would enhance the achievement of "poor" students.

Closely related to learning style preference is a variable that has been labeled educational set by Siegel and Siegel (1965). The two extremes of educational set can be described as follows: A factually set learner is one who, by definition, is predisposed to learn factual content. He/she adds units of information to his/her cognitive structure without being driven to interrelate these elements into any conceptual whole. For such a learner, a fact has an integrity of its own. A conceptually set learner is one who, by definition, rejects factual acquisition except as units of information that are clustered and interrelated. He/she prefers to learn concepts and principles. When confronted by a bit of factual information he/she either dismisses it as "unimportant" or subsumes it under a broader conceptual framework.

Siegel and Siegel (1965) measured educational set by a forced choice inventory (Educational Set Scale) which required preference judgments. They showed that conceptually set learners exhibited higher performance on both conceptual and factual aspects of a final exam in a televised college course.

In addition, Sanders and Tzeng (1971) found evidence that preference for conceptual versus rote learning was related to actual performance on concept learning and rote learning tests in the predicted directions.

Based on these findings and intuitive grounds it seems reasonable to attempt to alter educational set in a conceptual direction. However, it is possible that by the time a student reaches college age, his/her educational set is relatively fixed and resistant to change. If this is the case, the present studies suggest the wisdom of arranging for congruence between the student's set and the educational goals imposed upon him/her.

Preferences for various types of media will potentially influence learning in ways analogous to cognitive style, learning style preferences and educational set. The actual effectiveness of various media in conveying information may reflect preference or the differential availability of effective acquisition strategies for different modes of presentation.

The hypothesis that adults generally have preferences for visual information is supported by Lordahl's (1961) finding that, in a concept discrimination task, subjects were more likely to attend to visual than to auditory stimuli. Also, Stevenson and Siegel (1969) found that as children get older, they pay increasing attention to visual information in film presentations and less attention to the auditory information.

James (1962) asked 503 basic airmen to express preferences for taking a lesson by reading or by lecture (a no-preference option was permitted). There were no performance differences associated with preference but for the total sample learning by reading was superior to lecture. Preference was unrelated to ability, but the superiority of reading was greater for high-ability airmen.

In accord with the above study, at the high school level and beyond, research results usually favor reading over listening (Belcastro, 1966; Beighley, 1952; Cody, 1962). King (1968) and King and Madill (1968) found that with college students reading and listening were about equally effective for retention of factual material, but that reading was superior for the comprehension of the "gist" or "theme." Research with nonprose verbal materials supports the idea that visual presentation is increasingly advantageous for more difficult material (Schultz & Kasschau, 1966; Van Mondfrans & Travers, 1964).

Combined auditory-visual presentation of connected prose either shows no advantage over visual presentation or actually constitutes an interference (Mowbray, 1953), particularly if the materials are easy.

Study behaviors and attitudes. A number of questionnaires have been developed to survey students' study habits (strategies) and attitudes (e.g., Brown & Holtzman, 1966; Biggs, 1970 a and b; Goldman & Warren, 1973). Experiments assessing the utility of these questionnaires have shown that behaviors delineated in this relatively economical fashion, do relate to academic performance, and in many cases, overshadow traditional ability measures. It seems clear that measures of this type should be administered in order to assist in the diagnosis of learning difficulties. Once diagnosed, students can be given strategy training designed to ameliorate their specific problems. Approaches to this type of strategy training will be discussed in more detail in the section on skills to content transfer.

Summary of Educationally Relevant Principles

An examination of the research described in this section has led to the following suggestions for improving educational practices designed to foster content to content transfer:

1. Use existing readability formulas (see Carroll, 1971) to help select and/or create comprehensible instructional materials.

2. The general research on the facilitory effects of imagery would suggest that educators should attempt to select or develop concrete instructional materials that are liberally supported by pictures and illustrations and, where possible, to use such materials as precursors to learning more complex, abstract information.

3. Multidimensional scaling techniques and text grammar formulations should be used to provide a basis for organizing and sequencing instructional materials.

4. Make use of "web teaching" approaches (Norman, 1973). Teach a subject domain in a top-down hierarchical fashion by making explicit during initial exposures the general form or structural characteristics of the material to be presented (perhaps via overviews), and by gradually increasing the degree of detail and specificity.

5. Make sure individuals have appropriate prerequisite

information and create advance organizers to bridge the gaps between the student's existing cognitive structures and the target learning material. Both comparative and expository organizers (Ausubel, 1978) should be employed; these organizers should be made as concrete and as imagery evoking as possible.

6. High level adjunct post-questions (particularly application questions, see Table 1) should be used to facilitate transfer. These provide "forward" bridges to new materials. They also allow the instructor to assess the present state of the learner's knowledge as a basis for remediation. As illustrated in Figure 1, the learner's cognitive state is of critical importance as a prerequisite to subsequent transfer.

7. Less time consuming, guided, expository teaching methods should be used when the goal is "near" transfer, while discovery (trial and error) approaches (e.g., laboratory exercises) should be employed when "far" transfer is desired.

8. When feasible, instructional methods should be tailored to fit the styles, aptitudes, and preferences of identifiable subsets of learners. One salient example of the need for this type of tailoring is the finding that field independent students tend to learn better in a more permissive instructional environment, while field dependent students fare better with a more structured environment. Other important individual difference variables that should be considered in designing instructional methods are cognitive complexity, intellectual capabilities (e.g., structure of intellect dimensions), internal-external locus of control, and reception (learning) preference.

9. Individual differences in learning behaviors and attitudes should be assessed and used along with ability measures as a basis for assigning students to skills training programs. This suggestion will be amplified in a subsequent section on skills to content transfer.

SECTION III: SKILLS TO SKILLS TRANSFER

In this section the focus will be on the transfer of learned skills from one situation to another. Research relevant to cognitive and motor skills will be presented in separate subsections followed by a general section on important instructional variables.

Cognitive Skills

The term cognitive skills is used here to refer to those skills which involve primarily mental processes such as thinking and memory, and depend minimally on motor movement.

Learning skills. These skills are ones that facilitate the acquisition, retention, recall, and transfer of information. Rather than reviewing the relevant research at this time, a detailed discussion of learning skills will be presented in the section on skills to content transfer.

Problem solving and creativity. Skinner (1966) has defined a problem as a question for which there is at the moment no answer. This simple definition can be elaborated by categorizing problems into two major types: closed system problems and open system problems. Bartlett (1958) has suggested that closed system problems are formed in such a way that all the elements for solution are available, and what the problem solver has to do is fill in the appropriate element. In essence, closed system problems are characterized by the existence of an identifiable solution; further, progress towards this solution is usually also identifiable. Examples of closed system problems would include: anagrams, chess, logic and math problems, concept formation, equipment repair (trouble shooting), navigational problems, etc.

In open-system problems, the problem solver must go beyond the units immediately given in order to "close the gap." Neither the solutions nor progress toward solutions are easily identifiable with these types of problems. Examples of open system problems, which are usually studied under the rubric of "creativity" would include: determining unusual uses for common objects, creating cartoon captions and movie titles, inventing a new device or product, writing a term paper, etc.

Most of the prior research with closed system problem solving has employed relatively artificial tasks (e.g., anagrams) and consequently the generality of most of the findings to real world problem solving is questionable. However, in the context of traditional concept formation studies in which a subject is asked to discover an experimenter-defined concept such as "one red circle," Bruner, Goodnow, and Austin (1956) have identified two basic strategies that may have some generality beyond this artificial task situation. The two strategies, scanning (partist strategy) and focusing (wholist strategy), are used by subjects in both "selection" (subject determines the sequence of examples to be examined) and "reception" (experimenter determines the sequence) paradigms. In the scanning (partist) strategy the subject selects a portion of a positive instance to entertain as his/her hypothesis and concentrates his/her efforts on proving this hypothesis correct. Because the subject needs to scan and remember only the part of each instance that is relevant to his/her hypothesis, this approach is frequently employed by students. It does, however, have the disadvantage that the subject concentrates only on part of what he/she sees and is not likely to learn much while he/she is following a hypothesis that later proves to be wrong.

In the focusing strategy (wholist) the subject selects a positive instance, retains all aspects of it, and attempts to determine which attributes are irrelevant by comparing his/her retained positive instances to other positive instances. The differences between these two strategies may be clearer in the context of a literature review task. One could go through the recent issues of a likely journal and scan each article briefly (partist). Or one could, as soon as he/she came across a useful article, focus on it and then choose other articles in the light of the information obtained from this first positive instance (wholist).

Bourne (1963) and others have found the focusing or wholistic strategy to be more efficient in concept formation studies, but it is not always the most frequently used. Attempts at teaching college students this strategy in order to improve their concept formation performance have been successful (Klausmeier & Meinke, 1968). Perhaps such training would also lead to better performance in more real world tasks such as literature search and "trouble shooting."

Polya (1957) has developed a series of techniques or strategies which are applicable to problem solving in general. These techniques, called "heuristics," are "rules of thumb" for decreasing the extent of an individual's search through his internal problem space. Two of Polya's heuristics, means-ends analysis and planning, have been incorporated into a computer simulated model of human problem solving. The General Problem Solver (GPS), as it is called, appears to emulate quite accurately human behavior on problems in logi (Newell, Simon, & Shaw, 1958). It has also been expanded by Ernst and Newell (1969) to solve a variety of other closed system problems.

GPS using means-ends analysis, begins to solve a problem by detecting a difference between the location of a desired goal state (that is, the answer) and the present location of the subject with respect to that goal. If there is no discrepancy, there is no problem. If, however, a discrepancy does exist, the exact nature of this discrepancy has to be determined and a suitable plan formulated to remove the discrepancy. If this plan cannot be formulated directly, GPS must first formulate some subgoal that can, in fact, be met. Thus, any problem is first analyzed to discover whether a discrepancy exists between "where an organism is now" and "where he/she would like to be." This analysis gives rise to a series of subgoals, each one of which may require formulation into further, less difficult subgoals. This hierarchy of subgoals is then attacked in order of difficulty-beginning with the most difficult and proceeding through to the least difficult. Once all subproblems have been solved, the solution of the original and major problem can take place.

In order to make this heuristic a bit more concrete, consider the following example presented by Newell, Simon, and Shaw (1960): "I want to take my son to nursery school. What's the difference between what I have and what I want? One of distance. What changes distance? My automobile. My automobile won't work. What's needed to make it work? A new battery. What has new batteries? An auto repair shop. I want the repair shop to put in a new battery; but the shop doesn't know I need one. What's the difficulty? One of communication. What allows communication? A telephone...and so on."

In GPS an overall grasp of the problem is provided by the "planning" heuristic which consists primarily of changing an originally complex problem into simpler ones. This simplification is carried out by first abstracting the specific problem to more general terms, and then by simplifying the overall structure of the problem so that it can be subjected to a more direct means-ends analysis. Since the abstracting process serves to simplify the problem, this increases the likelihood that any proposed means-end solution will be successful. Solution steps generated at this level can then serve as plans or prototypes for steps to be taken with regard to the original, complex formulation of the problem.

Except for a few efforts in the concept formation domain, there have been virtually no systematic attempts at training general closed system problem solving techniques. Most problem solving training programs, some of which will be reviewed subsequently, have concentrated on training for creativity (open system problem solving). This situation should be remedied.

A good starting place for such programs would be to teach Polya's strategies and measure subsequent changes in closed system problem solving performance.

Generally, researchers have considered four stages of creativity (open system problem solving): preparation, incubation, insight, and verification. The preparation stage is typically restricted to a subject's attempt at understanding the problem through recall of his/her previous experience with similar problems, etc., (that is, the translation of the problem into an internal problem space). For our purposes this stage will be expanded to include the conscious production of potential solutions through operating on the problem space and preliminary judgments of the adequacy of produced solutions. In many cases, the steps contained within this preparation stage, which are analogous to those involved in closed system problem solving, are sufficient for production of an adequate solution. However, for various reasons, solutions generated at preparation stage may not be sufficient, and, in some cases, the remaining three steps may occur.

The incubation stage may consist of the unconscious production and judgment of solutions. Subjective reports of creative individuals (for example, Ghise in, 1952; Koestler, 1964) indicate that this incubation period may be facilitated by alterations in consciousness (sleep, reverie, drug-induced states, etc.). In fact, Green, Green, and Walters (Note 12) have drawn a series of inferences to support the notion that alteration of consciousness by brain wave training (bio-feedback) may potentially enhance creativity. They note that many creative people report effective incubation and subsequent insight in states where visual imagery is enhanced (in addition, responses to a visual imagery questionnaire correlate .21 with responses to a creativity questionnaire, Schmeidler, 1965). Further, Green, Green, and Walters have shown that subjects trained to produce theta brain waves report concomitant increases in visual imagery. They thus conclude that such brain wave training would enhance creativity via enhanced visual imagery, and have embarked on a research program to assess this hypothesis. Perhaps direct attempts at training imagery ability, as well as other imagery enhancement techniques, such as mediation training, could be usefully employed in this regard.

At some point during the incubation period, the open system problem solver may experience "insight" or "illumination." An unconsciously produced solution has apparently passed some criterion of judged acceptability. Following insight, the problem solver will usually make some attempt to consciously verify or judge the newfound solution. Depending on the outcome of this verification, the problem may be solved or the problem solving process may be again initiated.

Certainly the greatest effort toward strategy training has been leveled at this creative process. Two studies are relevant to the training of students to prepare (problem translation primarily) for open system problem solving. Hyman (1961) asked engineers to study attempts already made to design a system for recognizing boxes in an automatic warehouse. One group studied these previous attempts critically, in order to make up a list of faults; another group studied them constructively, in order to make a list of useful features. Later, when all subjects were asked to propose their own solutions to this problem, those who had studied constructively produced better solutions.

A parallel study by Torrance (1964) reached similar conclusions. He asked psychology students to read two articles in psychological journals, either critically or imaginatively, before the middle of the term. Then they had to develop an original idea, theory, or hypothesis and turn it in on the last day of the term. Again, the products of those who had read imaginatively received superior ratings for originality. Although these studies have some obvious flaws, they do contain potentially suggestive implications for education, and probably deserve careful replication and extension.

A number of attempts have been made to improve the quantity and quality of solutions produced in response to an open-ended problem. Most courses in brainstorming (for example, Osborn, 1953) attempt to increase quality and quantity by instructing participants to postpone criticism. Generally, it is assumed that criticism and harsh evaluation will interfere with flexible idea production. Laboratory studies directed toward this issue have usually led to the conclusion that relaxed conditions and instructions not to evaluate produce more ideas and ideas that have a higher mean quality rating as judged by "experts" than those produced under more restrictive and evaluative conditions (Johnson, Parrott, & Stratton, 1968; Meadow, Parnes, & Reese, 1959; Dentler & Mackler, 1964; Gerlach, Schultz, Baker, & Mazer, 1964). However, at least some researchers have concluded that instructions to "produce more ideas and withhold judgment" lead to a greater number of ideas, but an overall mean decrease in quality (Weisskopf-Joelson & Eliseo, 1961). It is probably the case that these different results are due to differences between the subject populations.

Researchers attempting to evaluate the effect associated with the training of specific idea-producing techniques have focused on Allen's (1962) morphological synthesis approach. This technique requires analysis of the dimensions of the problem followed by a new synthesis. Ideas for improving one feature of the product are listed along one axis of a two-dimensional diagram and ideas for another feature are listed on another axis so that novel combinations appear at the intersections. In comparison to two other idea-generating techniques, Warren and Davis (1969) found increased productivity and more superior solutions with the morphological synthesis technique. Furthermore, this technique has been included in a large-scale training program for adolescents with apparently favorable results (Davis, Houtman, Warren, & Roweton, 1969).

Perhaps the most extensive attempt to include production training in an educational setting has been made by Crutchfield and his colleagues (Crutchfield, 1966; Covington, Crutchfield, Davies, & Olton, 1974). They have developed a programmed text for fifth and sixth graders which encourages the children to think about the complex materials presented and directs the reinforcement toward the production of original and relevant ideas. In particular, the program is designed to instruct the student in the formulation of the problem, the asking of relevant questions, the laying out of a plan of attack, the generation of many ideas, the search for uncommon ideas, the transformation of the problem in new ways, the evaluation of hypotheses, and the openness to metaphorical and analogical hints leading to solutions.

A number of evaluation studies using open-ended problems (Crutchfield, 1966; Olton & Crutchfield, 1969) have found that students trained on the above method ask more questions, generate more ideas, and get higher ratings for creative quality than a matched control group. However, in a recent review of the literature, Mansfield, Busse, and Krepelka (1978) conclude that although some of the studies with this program provide evidence for its effectiveness, results obtained with tests dissimilar to the training materials (far transfer) have been inconsistent, so that it is unclear whether the effects are sufficiently generalizable to be useful in real-life situations. Mansfield et al. (1978), also reviewed a number of other creativity training programs and drew similar conclusions.

After a number of ideas have been produced, the open-ended problem solver must judge the solutions in order to provide a basis for selection. A few studies have emphasized this judgment process. These studies have provided "criteria-cued" instructions which spelled out the criteria to be used in evaluating the subject's productions and, in some cases, trained subjects on the use of these criteria. Generally, the "criteria-cued" instructions result in reduced productivity compared to nonevaluative instructions, but also produced a higher average quality and a higher percentage of superior solutions (for example, Johnson, Parrot, & Stratton, 1968; Weisskopf-Joelson, & Eliseo, 1961; Gerlach, Schultz, Baker, & Mazer, 1964).

Stratton and Brown (1972) trained subjects on both morphological synthesis (production) and judgment criteria. Using responses to a request for titles based on a variety of movie plots, they found that the combined training produced solutions of higher mean quality than those with only production training and a larger number of solutions than those with only judgment training. This combined training approach offers some promise and should undergo further exploration.

Although the prognosis for far transfer of general problem solving and creativity skills does not appear to be very promising, it is possible that, if training on these skills were embedded in a particular technical area, transfer would be facilitated.

Motor Skills

The positive transfer of simple motor skills, such as those involved in the pursuit rotor tracking task, has been demonstrated in a number of studies (e.g., Holding, 1966). With respect to more complex motor skills, Duncan (1960), using a motor task analogous to verbal paired-associate learning (visual stimuli and motor responses were paired), showed that practice with one set of stimuli and responses would facilitate transfer to other similar sets of stimuli and responses. This was particularly true when the original training was conducted over a variety of training tasks. These results are supported by another study (Russell, Note 13) which demonstrated that performance of a pencil-target task was also facilitated if subjects had previous experience with a variety of similar tasks.

Of particular interest are those few studies which indicate that transfer occurs for motor tasks that are both complex and have ecological validity. Pilot simulator research (Valverde, 1973), for example, has indicated that effective transfer occurs between mock-ups of both low and high similarity (far and near transfer) with actual flight. Singer (1977) in his review article has also reported studies by Prather (e.g., Berry, Prather, & Jones, 1971) which indicate that complex perceptual motor skills, such as range estimation used by airline pilots are transferable. Instructional variables that facilitate this and other types of skills to skills transfer will be discussed in the next subsection.

Instructional Variables

In this section instructional variables that potentially have impact on all types of skills to skills transfer will be discussed.

Discovery vs. guided instruction. Whether discovery learning (trial and error) or guided (prompted) learning leads to better transfer of skills has been an area of debate in instructional psychology for some time. Singer (1978) has reviewed motor skills research and has concluded that the method of instruction given should be dependent on the type of transfer task and the amount of training time available.

A series of studies conducted by Prather (e.g., Berry, Prather, & Jones, 1971) compared trial and error learning to error-free learning in the training of complex perceptual-motor skills. In general, Prather has found that while prompted learning led to faster acquisition of skills, trial and error learning produced greater posttraining transfer. Also, Singer and Gaines (1975) have reported better transfer for a discovery method of instruction when a learning to criterion method is used. In addition, Egan and Greeno (1973) have found that discovery learning, as opposed to rote learning, leads to broader transfer in mathematics. Far transfer of problem solving strategies appears to be facilitated by a discovery method of instruction (Guthrie, 1967). Finally, Singer and Pease (1976), using three groups (discovery vs. prompted vs. discovery/prompted), found no difference in the amount of transfer between discovery and discovery/prompted learning, but did find that both of these instructional methods led to better transfer than prompted (guided) learning alone.

Contradictory studies in this area have been reported, however. For example, Macrae and Holding (1966) have suggested that prompted learning facilitates transfer on a complicated perceptual-motor task, and that trial and error learning leads to better transfer on simpler tasks. A later study by Singer and Pease (1976), on the other hand, found no interaction between task complexity and instructional method.

However, studies reporting positive effects of discovery learning transfer should be viewed with caution, since many times the tests used for measuring transfer are often similar to or the same as the discovery method training (Singer, 1977). Further, Singer and Pease (1976) have reported that when groups receiving discovery training are tested with a prompted learning task, they demonstrate less transfer than do groups who received prompted training. Many of these studies may, therefore, only be testing the efficacy of transfer across similar situations, and not the effectiveness of various modes of instruction.

Meaningfulness of instruction. Mayer (1975), in a series of experiments, has investigated the meaningfulness of instruction and its effects on transfer. The term meaningful is used here to refer to instruction which attempts to relate new information to the learner's previous experience and knowledge. one set of experiments (e.g., Mayer, 1974, Mayer & Greeno, 1972) students were taught the concept and application of binomial probability. Typically, these experiments used two groups. One group would be given meaningful instruction which emphasized relating previous experience to the learning of the binomial probability formula, while a second group was given instructions which consisted only of a formal statement of the rules for calculating binomial probabilities. Results from two experiments (Mayer, 1974; Mayer & Greeno, 1972) revealed that near transfer was facilitated by "rule" instructions, and that far transfer was facilitated by meaningful instruction. These findings are supported by Mayer, Stiehl & Greeno (1975) who found that students who received pretraining in the general concepts of probability and combinations demonstrated better far transfer on applications of the binomial formula than students who did not receive pretraining.

It can be concluded from these studies that the transfer of skills is influenced by the degree to which they are integrated with a learner's prior knowledge. Related studies by Wittrock and Cook (1975), among others, support the general contention that transfer is facilitated when newly learned skills are spcifically related to a person's previous experience.

Instructions to integrate. Gagne's model (Gagne & White, 1978) of memory structures (Figure 2) leads to the prediction that skills learning which involves two or more memory structures (intellectual skills and propositions for example) would lead to both better retention and transfer of the acquired skills. In this regard, early studies on problem solving (e.g., Katona, 1940; Maier, 1930) generally support the contention that verbal statements of problem solving rules facilitated their retention and transfer. In addition, the previously mentioned studies by Mayer also support Gagne's view, since training subjects by a meaningful instructional method often involved the stating of rules (i.e., propositions).

Instructional methods involving images and episodes in learning and transfer of skills have also been the subject of investigation (Gagne & White, 1978). Those studies emphasizing the use of imagery generally show positive results. Research by Zimmerman and Rosenthal (e.g., Zimmerman & Rosenthal, 1974; Rosenthal, Moore, Dorfman, & Nelson, 1971) suggest that activation of both verbal and visual memory structures leads to better transfer than the use of either memory structure alone.

Studies involving more manipulative tasks (episodes), however, are more equivocal with only about half of the studies supporting an integration point of view. Studies by Bruner (1966), Sonstroem (1966), Dawson and Ruddell (1955), and Bledsoe, Purser, and Frantz (1974) have obtained positive results for the use of episodes (manipulative experiences) in learning, retnetion, and transfer. These studies, however, are counter-balanced by other research which has either reported neutral or contradictory results (e.g., Fennema, 1972; Passy, 1963; Trueblood, 1970).

Educational Implications of the Skills to Skills Transfer Research

By way of summarizing, the following instructional implications have been gleaned from the research on skills to skills transfer:

1. Open and closed system problem solving training courses should be developed and administered in close conjunction with a specific technical or academic domain. Since general training on problem solving skills has not proven successful in the past, the developers of problem solving courses should tailor the training to those skills required in a particular academic or technical area.

2. Discovery and meaningful learning should be emphasized in the classroom when broad generalization of skills is desired. Guided learning approaches can be employed when near transfer is the major goal.

3. In teaching skills, teachers should encourage the

student's use of various memory structures, such as imagery and verbal propositions, to increase the retention and transfer of skills. This type of manipulation should improve the integration of the learner's cognitive structure which should in turn improve subsequent transfer (see Figures 1 and 2).

SECTION IV: CONTENT TO SKILLS TRANSFER

This type of transfer occurs when an individual's prior knowledge influences the acquisition of a new skill. While content to skills transfer is probably involved in all skill learning situations, it has been the subject of a surprisingly small amount of research. In the area of perceptual-motor learning, at least, it has been argued by Marteniuk (1976) that the first step (e.g., the cognitive phase of motor learning) in executing a motor skill is to establish a plan or goal for performance and then collect pertinent information for achieving that goal. In other words, the most effective way to acquire a new skill is to possess relevant knowledge that will transfer to the learning of the new skill. This general theme is echoed by Fitts (Fitts & Posner, 1967) who states that it is during the cognitive phase of skill acquisition that the learner must form an idea or schema of the entire skill to be performed. Adams (1971) also promotes a similar view, suggesting that the early stages of motor learning are highly dependent on the verbal skills of the learner.

While these ideas have an obvious intuitive appeal for motor skills acquisition, it also seems reasonable that skill acquisition in a number of other areas would be facilitated if the learner could transfer appropriate content knowledge to the learning task. For example, Lave (1977) has demonstrated that one's general knowledge can affect problem solving skills. In this study, Liberian tailors varying in amount of tailoring experience and degree of education were asked to solve an arithmetic problem which was presented in either a formal education or tailoring surface format. Transfer efficiency was significantly related to the content knowledge of the subjects. A relatively high degree of tailoring knowledge led to success across tailoring problems, and more experience with formal education led to transfer across school-formulated problems.

Several researchers have attempted to manipulate a learner's prerequisite knowledge relevant to acquiring a skill. Miyake & Norman (1979), have demonstrated that a person's knowledge of a specific content area greatly affects his/her use of a comprehension strategy such as questioning. Matching students, either trained or untrained, in operating a computer terminal with either easy- or hard-to-comprehend programming manuals, Norman found that untrained programmers tended to use a questioning strategy more often when instructed with the easy manual. Conversely, trained programmers tended to ask more questions when instructed with the hard manual. A general conclusion based on this study is that, in order to generate questions, a student needs to have some minimal amount of knowledge relevant to a topic available to him/her at the time of learning.

A number of studies by Mayer (1975; Mayer, Stiehl, & Greeno, 1975) have indicated that in general, meaningful and interpretative applications of problem solving skills are enhanced by instruction in content knowledge relevant to the transfer task. Specifically, Mayer, Stiehl, and Greeno (1975) found that preinstructional experience directly related to arithmetic problems and varied in content (general knowledge and formula computation) facilitated skill learning under a meaningful instruction condition. In another study, Mayer (1975) had nonprogrammers learn a computer programming language through the use of a diagram model of the computer expressed in familiar terms or without the use of a model. In general, subjects in the model condition excelled on learning and transfer problems requiring interpretation, while nonmodel subjects did better on near transfer tasks requiring only generation of programs similar to those given in the instructions.

Along a similar line, Trollip (1979) used computer-assisted instruction (CAI) to train pilots in the skill of flying holding patterns. This training required the student to artificially "fly" a series of holding patterns at different levels of complexity. Students were given detailed pictorial and verbal feedback about their performance. Consequently, the student should be acquiring both knowledge and experience relevant to performing the required task. Students trained under this condition, when compared with traditionally trained students, demonstrated better performance in an evaluation flight. This suggests that the CAI-trained students could use their prior knowledge gained from feedback on their performance to facilitate their learning of actual flight skills. A final study in this area was conducted by Berg and Stone (1978). Testing whether modeling or verbal instructions were better for enhancing problem solving skills, they found that both methods of instruction and a combination of the two methods resulted in superior performance on a problem solving task compared to a control group. These results support the notion that the prior content knowledge that a person has which is relevant to performing a skill will lead to more effective learning and use of that skill.

To briefly summarize, it appears that the prior content knowledge of a learner, if it is meaningful knowledge, functions similarly to Ausubel's (1963) advance organizer. That is, a person's prior knowledge serves as an "ideational scaffold" for the incorporation of new skills into the person's behavioral repertoire. Further, studies by Mayer and Greeno (Mayer, Stiehl, & Greeno, 1975; Mayer, 1975; Egan & Greeno, 1973) have given us some information on how different instructional methods interact with the prior knowledge of an individual in skill learning. In general, the basic conclusion of these studies is that those instructional techniques which emphasize meaningful learning are more effective for those students who already possess knowledge about the skill to be learned (typically an arithmetic problem). On the other hand, those students who lack prior knowledge about a skill tend to do better under more rote learning conditions. This type of interaction is typically obtained whether the learner's prior knowledge is acquired within the experimental manipulation (preinstruction), or is taken as a pre-experimental given.

The research reviewed in this section indicates that the following suggestions for improving educational practices should be considered:

1. In teaching a new skill, instructions should include content knowledge that is specific to the learning of that skill.

2. An attempt should be made to present new skills in a meaningful context if broad transfer effects are desired, while a more rote or algorithmic approach should be used if near transfer is the goal of instruction.

3. Knowledge relevant to acquiring a new skill should be presented without an excess of distracting stimuli. In other words, present a simple example of the skill and the context in which it is used before attempting to instruct the learner in more complicated aspects of the skill.

4. It should be a general practice to expose learners to varied types of knowledge about a skill to increase the effectiveness of transfer.

SECTION V: SKILLS TO CONTENT TRANSFER

This type of transfer involves the learning of skills that subsequently facilitate the acquisition, retention, retrieval, and transfer of knowledge. These types of skills or strategies are typically taught in separate study skills or learning strategies classes or workshops. In this section the prior research relevant to learning strategy instruction and training will be briefly reviewed. First, research exploring specific, isolated strategies will be discussed, followed by a review of studies of the effectiveness of larger strategy systems. The research in this general domain examines the types of content-independent knowledge discussed in conjunction with Figure 1 (see Section I: Introduction).

Manipulation of Specific Learning-Related Strategies

Most of the prior research on learning strategies has focused on assessing the effects on performance that result from isolated manipulations of component strategies. These studies have dealt with four primary strategy areas: identification, comprehension, retention, and retrieval; and one support strategy area: concentration. A brief overview of prior attempts to study each of these components follows.

Accurate identification of important, difficult, and unfamiliar material is necessary for appropriate allocation of students' time and energy. If such allocations are not accurate, then the resulting learning will be inefficient. In the past, the general approach to research in this area has been to manipulate the identification and selection of stimulus material by varying anticipated recall requirements (Butterfield, Belmont, & Peltzman, 1971; Cermak, 1972; Jacoby, 1973) or monetary payoff conditions (McConkie, Rayner, & Mayer, Note 14; McConkie, Rayner, & Wilson, 1973). These studies do show that students can be flexible in their processing of incoming information, but the manipulations are so task-specific that they appear to have little applicability to strategy enhancement in general.

In the area of comprehension and retention, most of the attempts at improving students' skills have been indirect and have entailed stimulating the students to change their comprehension and retention activities with experimenter-generated pre, post, and interspersed questions (e.g., Frase, 1968; Mayer, 1975; Richards & DiVesta, 1974; Rothkopf & Bisbicos, 1967), pre- and postsupplementary organizing materials (e.g., Allen, 1970; Ausubel & Youssef, 1966; Frase, 1969; Gay, 1971; Scandura & Wells, 1967; Bauman & Glass, Note 15), and varying payoff conditions (McConkie & Meyer, 1974; McConkie & Rayner, 1974; McConkie et al., 1973). The findings of these studies generally indicate that the procedures had positive influences on the students' comprehension and retention strategies (see Dansereau et al., 1974, and the section on content to content transfer for a more thorough discussion of these studies). However, since these approaches require experimenter or teacher manipulations, they are not directly transferable to less controlled situations.

More direct manipulations of comprehension and retention strategies have been based on simply instructing (generally without training) the student on a particular technique. Positive effects on performance have resulted from instructions to form mental images (pictures) of verbal materials (Anderson, 1970; Anderson & Hidde, 1971; Levine & Divine-Hawkins, 1974; Rasco, Tennyson, & Boutwell, 1975), instructions to state the material in the student's own words (DelGiorno, Jenkins, & Bausell, 1974), and instructions to reorganize the incoming material (DiVesta, Schultz, & Dangel, 1973; Frase, 1973). These instructional manipulations, although somewhat effective as they were first tried, could probably be enhanced by actual training and by integration with training on other aspects of the learning process.

There has been a dramatic upsurge of interest in mnemonic elaboration as a specific means for enhancing retention. Generally, mnemonic techniques involve embellishing the incoming material by creatively interrelating the items to be learned or by associating the items to a previously learned set of peg words or images (mental pictures). The following are some examples of mnemonic techniques:

First letter -- In order to remember the ordering of the 12 cranial nerves (olfactory, optic, oculomotor, trochlear, etc.) many of us have learned the phrase "On old Olympus' towering top a fat, agile German vaults and hops." The first letter of each word is also the first letter of each of the major cranial nerves.

Peg word -- A person first learns a rhymed peg word list such as "one-bun, two-shoe, three-tree," and then learns to associate imaginatively each of these words with the members of a list to be learned. For example, in learning the items on a grocery list (e.g., steaks and potatoes) the student might first image bun and steak together as a sandwich, then potato and shoe as an Idaho potato in tennis shoes, etc. When asked to recall the second item on the list he/she locates the second pegword, shoe, and then recalls the image of the potato in tennis shoes.

Method of loci -- A learner mentally places items in distinct locations along a very familiar route (e.g., the route from the person's front door to the back bedroom). In order to recall the information, the student imagines traveling back through the route, picking up the items as they occur.

Many studies using lists of unrelated words and word pairs have shown that brief instructions on mnemonic techniques dramatically improve retention (Bower & Reitman, 1972; Danner & Taylor, 1973; Groninger, 1971; Lowry, 1974; Nelson & Archer, 1972; Santa, Ruskin, & Yio, 1973; Wanshura & Borkowski, 1974; Weinstein, 1975; Yuille & Catchpole, 1974). Although these mnemonic techniques have been successful with relatively artificial materials (nonsense syllables and unrelated words), very little effort has been made to apply these techniques to the more general problem of retaining connected discourse. (An important exception to this is the work of Weinstein, 1978).

Although the previously discussed approaches to strategy manipulation improve a student's ability to recall information, they do so indirectly, by operating on the student's storage processes. More direct approaches are possible, involving retrieval plans for accessing stored materials that are not immediately available. These plans would most likely take the form of coherent search strategies similar to those used in solving problems that have well-defined solutions (e.g., chess problems often require the search for an optimal next move). The problem-solving strategies explored by Newell et al. (1958), provide a good starting place for the development of such techniques.

Unfortunately, very little work has been done in training students to use search strategies as aids to memory retrieval. The one exception is a study by Ritter, Kaprove, Fitch, and Flavell (1973), which attempted to improve children's recall performance by instructing them in what the researchers called "planful retrievals" (e.g., systematic search strategies). The results of this study indicated that the retrieval instructions helped, but the stimuli employed were so artificial (unrelated word pairs) that it is difficult to generalize the results to more meaningful tasks.

The last component to be considered in this section is concentration. Generally, attempts to improve concentration have been oriented toward teaching students to talk to themselves in a constructive, positive fashion as a means of coping with distractions and anxiety (Meichenbaum & Goodman, 1971; Meichenbaum & Turk, Note 16;Patterson & Mischel, 1975) or they have been oriented directly toward manipulating the student's attention through behavior modification techniques (Alabiso, 1975). Both of these approaches have successfully increased the quantity of task-related behavior, but, unfortunately, they have not been coupled with strategies designed to increase the quality of such behavior (e.g., students may be trained to spend more time looking at a textbook, but additional training is probably needed to increase the quality and intensity of what they are doing while reading). Clearly this combination should be the ultimate target for a program designed to enhance learning skills.

In summary, the studies that have been reviewed to this point have suffered from at least two problems. First, the materials and tasks used to examine the manipulations have generally been highly artificial (e.g., serial and paired-associate lists of unrelated information). This artificiality limits the generality of these findings to educationally relevant situations. Second, specific components have been studied in isolation (i.e., they have not been integrated with training on other components of the learning process). This lack of integration is extremely troublesome in light of the obvious interrelationships between some of the components (e.g., enhancing comprehension-retention skills will clearly have an impact on retrieval, and vice versa). These interrelationships should enable a well-conceived, integrated program to have an impact greater than the sum of its individual parts. In the next section some of the prior attempts that have been made at developing such integrated training will be briefly examined.

Evaluations of Strategy Systems

Unfortunately, many of the reported learning strategies programs have nonempirical foundations, provide relatively superficial strategy training (usually only a subset of the essential learning concepts), are evaluated against nonspecific criteria (such as grade point average), and, consequently, lack specific evidence on which to base modifications.

The majority of these learning skills programs are based on the SQ3R approach proposed by Robinson (1946), or some slight modification of this approach. The five steps in the SQ3R technique require students first to survey the text chapter by reading headings, boldface type, etc. On the basis of the survey students are encouraged to develop questions. Then they read the material with an eye toward answering these questions. After reading, students are encouraged to close the book and recall what has been read. Finally, they open the book and review the material. Generally, SQ3R training is nonspecific; very little detailed information is provided on how to carry out the operations. It is assumed that the individual student is able to arrive at these more specific procedures without guidance. In light of the results with a learning strategy inventory (Dansereau et al., 1975a), this assumption is probably unwarranted; students appear to have little knowledge of alternative learning procedures, especially at a detailed level.

In any case, a number of programs of this type have been developed and shown to lead to improvement on measures of grade point average (Briggs, Tosi, & Morley, 1971; Whitehill, 1972) and on self-report study-habit surveys (Bodden, Osterhouse, & Gelso, 1972; Brown, Webe, Zunker, & Haslam, 1971; Haslam & Brown, 1968; Van Zoost & Jackson, 1974). Although these programs probably benefit the student in a general way, the locus of the effects has not been determined. In addition to general measures of academic success, specific evaluations of learning performance should be made. Furthermore, these evaluations should be related to specific components of the programs to provide a basis for modification. However, even if the previously cited programs are successful, they could probably be improved by incorporating some of the more detailed strategies discussed in the previous section and by adding other strategies derived from the basic cognitive research literature on memory, comprehension, problem-solving, etc. The learning strategy training program to be discussed next was designed to overcome some of these criticisms.

A detailed description of the learning strategy training program developed at Texas Christian University is beyond the scope of this paper; the various portions of the system have been presented in a number of other technical reports and publications (Collins, Dansereau, Garland, Holley, & McDonald, 1981; Dansereau, 1978; Dansereau, Actkinson, Long, & McDonald, 1974; Dansereau, Collins, McDonald, Garland, Holley, Evans, & Diekhoff, 1978; Dansereau, Collins, McDonald, Holley, Garland, Diekhoff, & Evans, 1979a; Dansereau, Long, McDonald, & Actkinson, 1975a; Dansereau, Long, McDonald, Actkinson, Ellis, Collins, Williams, & Evans, 1975b; Dansereau, Long, McDonald, Actkinson, Collins, Evans, Ellis, & Williams, 1975c; Dansereau, Long, McDonald, Actkinson, Collins, Evans, Ellis, & Williams, 1975d; Dansereau, Long, McDonald, Actkinson, Collins, Evans, Ellis, & Williams, 1975e; Dansereau, McDonald, Collins, Garland, Holley, Diekhoff, & Evans, 1979b; Holley, Dansereau, McDonald, Garland, & Collins, 1979), and the reader is referred to these documents for further information. In the remainder of this subsection a brief overview of this program will be presented.

The general approach to the development of this strategy system has been strongly influenced by the fact that effective interaction with technical material requires that the student actively engage in a complex system of interrelated activities. To assist the student in this endeavor, a set of mutually supportive strategies has been created. This set can be divided into "primary" strategies which are used to operate on the material directly and "support" strategies which are used to help the learner to maintain a suitable cognitive climate. The primary set includes strategies for acquiring and storing the information and strategies for subsequently outputting and using the stored information. Networking forms the basis for these primary strategies. During acquisition the student identifies important concepts or ideas in the material and represents their interrelationships in the form of a network map. To assist the student in this endeavor s/he is taught a set of named links that can be used to code the relationships between ideas. The networking processes emphasize the identification and representation of (a) hierarchies (type/part), (b) chains (lines of reasoning/temporal orderings/causal sequences), and (c) clusters (characteristics/definitions/analogies). Figure 4 is a schematic representation of these three types of structures and their associated links and Figure 5 is an example of a summary map of a nursing textbook chapter. Application of this technique results in the production of structured two-dimensional maps. These cognitive networks provide the student with a spatial organization of the information contained in the original training materials. While constructing the map, the student is encouraged to paraphrase and/or draw pictorial representations of the important ideas and concepts for inclusion in the network.

When faced with a test or a task in which the learned information is to be used, the student is trained to use the named links as retrieval cues and the networking process as a method for organizing the material prior to responding. Assessments of networking (Holley et al., 1979; Dansereau et al., 1979b) have shown that students using this strategy perform significantly better on text processing tasks than do students using their own methods.

A second major aspect of the primary strategies is the use of knowledge schemata for organizing and retrieving information. These schemata specify the set of categories of information a well-informed learner should know about a particular topic. As an example, the following categories of information about a scientific theory were gleaned from questionnaires administered to students at a variety of educational levels:

1. Description -- A short summary of the theory.
2. Inventor/History -- A brief account of the theory's history.

3. Consequences -- A summary of how the theory has influenced man.

4. Evidence -- A summary of facts which support or refute the theory.

5. Other Theories -- A summary of theories dealing with the same phenomena.

6. X-tra Information -- An open category which includes any information not in one of the other 5 categories.

In an independent evaluation of the effects of knowledge schema training, Brooks and Dansereau (Note 3) found that this type of training significantly improved performance on a delayed essay test over a 2,500-word passage on the theory of plate tectonics.

The major component of the support strategies is concentration management. This component, which is designed to help the student set and maintain constructive moods for studying and task performance, consists of a combination of elements from systematic desensitization (Jacobsen, 1938; Wolpe, 1969), rational behavior therapy (Ellis, 1963, Maultsby, 1971), and therapies based on positive self-talk (Meichenbaum & Goodman, 1971; Meichenbaum & Turk, Note 16). The students are first given experiences and strategies designed to assist them in becoming aware of the negative and positive emotions, self-talk, and images they generate in facing a learning task. They are then instructed to evaluate the constructiveness of their internal dialogue and are given heuristics for making appropriate modifications.

In preparing for studying or testing sessions students report that they usually spend little or no conscious effort establishing constructive moods. To remedy this situation the student is trained on a technique that forms the basis of systematic desensitization: imagination of the target situation during relaxation. More specifically, the students are instructed to spend 2 to 3 minutes relaxing and then imagining their actions as they proceed through a productive study or test session. To help them maintain the resulting mood they are given experiences and techniques to assist them in determining when, how, and why they get distracted, the duration of their distraction periods, and their typical reactions to distraction. They are then trained to cope with distractions by using relaxation and positive self-talk and imagery to reestablish an appropriate learning state.

This particular combination of concentration management strategies has been shown to lead to significantly better performance on text processing tasks in comparison to students using their own methods (Collins et al., 1981). These strategies have been supplemented by training on goal-setting, scheduling, and monitoring (see Dansereau et al., 197[illegible]), to form the support strategy component of the program.

Overall evaluations of this program (e.g., Dansereau et al., 1979a and b) have shown that it facilitates the learning of scientific text and, consequently, should facilitate the transfer of acquired knowledge from one situation to another.

Educational Implications

Many teaching and testing methods implicitly encourage rote memorization by specifying exactly what must be learned, rewarding verbatim answers on tests, and putting little emphasis on the development of relationships between incoming and stored information. Rote memorization usually involves multiple readings of the material with little or no effort devoted to assimilating the information. Therefore, the material learned through this method usually is not meaningfully related to other stored information, which limits the facility with which such information can be retrieved and used at a later date. Such a strategy, although perhaps useful in our present educational environments, is very maladaptive in many job situations, where understanding is far more important than mere storage. Although the limitations of rote memorization have been emphasized, the same arguments probably apply to a large number of other strategies developed by students to cope with a teaching-oriented education.

By not stressing learning strategies, educators, in essence, discourage students from developing and exploring new strategies, and, in so doing, limit students' awareness of their cognitive capabilities. For example, the results of the administration of an extensive learning strategy inventory (Dansereau, Long, McDonald, & Actkinson, 1975a) indicate that even good college students have very little knowledge of alternative learning techniques. This lack of awareness obviously limits an individual's ability in a situation requiring new learning strategies. In addition, if the strategies that individuals have spontaneously adopted do not match their cognitive capabilities, the emotional toll may be very large. Most of us know individuals who spend inordinate amounts of time memorizing college or high school materials and are still barely "getting by." Such an individual's personal, intellectual, and social development must certainly suffer from the pressures created by this use of a relatively inefficient learning strategy.

The answer to this situation is clear: Educators should be redirecting at least some of their efforts to the development and training of appropriate learning strategy skills. It is suggested that such training include an emphasis on both primary and support strategies. In particular, the strategies should be focused on creating integrated knowledge structures that would facilitate subsequent transfer (see the Introduction for a discussion of Gagne & White's 1978 formulations of integrated knowledge structures). The networking and knowledge schema strategies discussed earlier should provide good bases for the creation of integrated knowledge structures.

SECTION VI: EDUCATIONAL IMPLICATIONS OF TRANSFER-RELATED RESEARCH

Introduction

In this section teaching and learning principles that appear to have potential for facilitating transfer from one situation to another will be discussed. Only rarely will an attempt be made to distinguish between the effects of these principles on the normally hearing and the hearing impaired. In most cases the implementation procedures and the expected outcomes would be the same for both populations. However, to provide a focus the discussion will be related to instructional practices that are similar to those applicable at the National Institute for the Deaf in Rochester, New York.

In the main introduction to this paper the importance of examining the role of the learner/performer in the transfer situation was emphasized (see Figure 1). In particular, it was suggested that instructional practices should be designed to assist the individual in developing and using integrative memory structures (interrelated propositions, images, episodes, and skills). The remainder of the paper has examined research on principles that have potential for facilitating this process in four types of transfer situations: content to content, skills to skills, content to skills, skills to content. Content to content transfer would predominate in transfer between and within content courses; skills to skills transfer would occur between and within skills-oriented technical courses, as well as between skills courses and a job situation; content to skills transfer would predominate between content and skills courses; and skills to content transfer would occur between supplementary learning problem solving courses and content courses. Although the instructional principles relevant to these four transfer areas vary to some extent, their commonalities far outweigh their differences. Further, in most real-world instructional systems, there is a greater blending of skills and content within courses then is portrayed by the simple classification that has been used to subdivide transfer-related research. Consequently, in this section this classification scheme will be abandoned in order to provide a different perspective on how these principles might be applied. For additional information, the reader is referred back to the summaries at the end of each of the previous four sections.

Implications of the transfer-related research for teaching methods, development of instructional materials and use of supplementary courses in learning and problem solving will be described in the following subsections.

Development of Instructional Materials

One of the major findings emerging from this review is the apparent importance of supplementary materials (e.g., advance organizers, adjunct questions) in facilitating retention and transfer. It is suggested that these materials act as bridges between the student's knowledge structures and learning/performance situations. The results of research with these types of materials are sufficient to warrant their extensive use in educational settings. Adjunct post questions and advance organizers should be developed to bridge the "gaps" between units of instruction and between courses. One extension of this approach would be to pre-test students and provide different supplementary material depending on their existing knowledge. The development of these types of materials will require someone who is knowledgeable about broad sections of the curriculum as well as the knowledge bases of the participating students.

It would seem likely that procedures for evaluating students could be easily incorporated within a "bridging" system. This would require the development of tests that included transfer-oriented questions (i.e., high level adjunct questions, see Table 1). These types of questions would not only be useful in evaluating students' current states of transferable knowledge, but would also serve to positively direct the students' learning processes.

In addition to developing a supplementary "bridging" system, some of the research suggests that courses and series of courses should be sequenced from general concepts and principles to specific details and examples. This approach, which has been advocated by Norman (1973) and Thorndyke (1977), presumes an expository mode of teaching. However, under some conditions it may be more effective to encourage discovery learning, which tends to imply a specific to general sequence of instruction. This issue will be discussed further in the next subsection.

As a final point, the research suggests that there should be considerable benefits associated with concretizing and simplifying instructional materials. This implies a liberal use of pictures and diagrams and a reduction in vocabulary level and syntax complexity. Attempts by the military (Sticht & Zapf, 1976) to accomplish these goals with their technical training materials should provide useful guidelines for more general implementations. However, it should be noted that re-writing text is not a substitute for teaching students effective strategies. Rather, both approaches should be undertaken in concert.

Teaching Methods

As stated earlier the evidence from the research on different teaching methods would suggest that an omnibus approach to instruction is ill-advised. Rather, instructional method should be tailored to fit the desired learning outcomes and the individual aptitudes, styles, and preferences of the learners. For example, discovery (trial and error) learning methods would be most useful in establishing a basis for "far" transfer with field independent learners, while expository (guided) teaching methods would be more effective in promoting "near" transfer with field dependent students. Since it has been found that hearing impaired students tend to be more field dependent than hearing students (Paras is & Long, 1979), it would seem reasonable to emphasize expository teaching methods and to attempt to increase the similarity ("nearness") between the training and transfer tasks in technical programs for the hearing impaired. Where further transfer is required, a combination of discovery and expository methods may be useful. Singer and Pease (1976) found that this type of combination approach was equal to a pure discovery learning condition in its effects on retention and transfer performance. These authors conclude that at least a partial discovery instructional methodology should be used in a learning situation which does not allow for the total use of discovery methods (trial and error).

Regardless of the type of teaching method employed, the review of the literature by Gagne and White (1978) indicates that, wherever possible, concepts and principles should be presented redundantly in the form of propositions, images, episodes, and skills. Further, attempts should be made by the teacher to illustrate the interrelationship between these bodies of information.

Supplementary Courses in Learning and Problem Solving

It is clear that many students can benefit from skill and strategy training courses. Consequently, these types of courses should be integrated within existing curricula. The training programs reviewed in previous sections of this paper should provide a good starting place for the development of courses designed to meet the needs of specific curricula. It is suggested that, if possible, the skills and strategy programs should be run in parallel with regular content courses. In this way strategies can be reinforced by content course instructions, and content course information can be used as the basis for practice materials within the skills and strategy programs.

General Conclusions

The review of transfer related research has indicated that the retention and transfer of information can be enhanced by manipulating the instructional materials, employing effective teaching methods, and by instituting supplementary learning/problem solving courses. It is suggested that a concerted effort be made to implement changes in all three of these areas in order to maximize the impact on educational outcomes.

TABLE 1

Types of Questions Used in Adjunct Questions Studies

Type	Description and Studies
Factual Questions	All studies compare higher order questions to some type of factual question. Factual Questions typically asked the reader to supply or recognize some item of information given in the passage. Factual questions are typically primarily verbatim as defined by Anderson (1972). Types of information requested have included names, numbers, dates, definitions, terms, etc.
Paraphrased Questions	Paraphrased questions are factual questions written with no substantive word overlap between text and question. Anderson and Biddle (1975), Andre & Womack (1978), and Andre and Sola (1976).
General Questions	General questions are factual questions which refer to more than one text sentence. They are usually verbatim in nature. Frase (1968).
Application Questions	Application questions require students to select a new example of a concept of principle employed in the text from among alternatives. Andre (Note 10), Dapra & Felker (Note 7), Moore (Note 8), Shavelson et al (1974), Watts & Anderson (1971).
Meaningful Learning Questions or Inference Questions	These questions require a reader to state a relationship between elements of the passage that is implied but not explicitly stated in the passage. Frase (1969a, b; 1970a, b; 1972), Frase and Selbiger (1970), McKenzie (1972), Rickards (1976a, b), Rickards and Hatcher (Note 2), Rickards and DiVesta (1974), Watts (1974).
Higher-Order Questions, Analysis Questions, and Evaluation Questions	Usually defined as being above the memory level of the Bloom et al (1956) Taxonomy or at some specific level of the Taxonomy and not further defined. Allen (1970), Hunkins (1969), McConkie et al (1973), Shavelson et al (1974).

Table #1 of T. Andre's "Does Answering High-level Questions While Reading Facilitate Productive Learning?" Review of Educational Research, 1979, 49(2), pp. 280-318. Copyright 1979, American Educational Research Association, Washington, D. C. Reprinted by permission.

BEST COPY AVAILABLE

Figure Captions

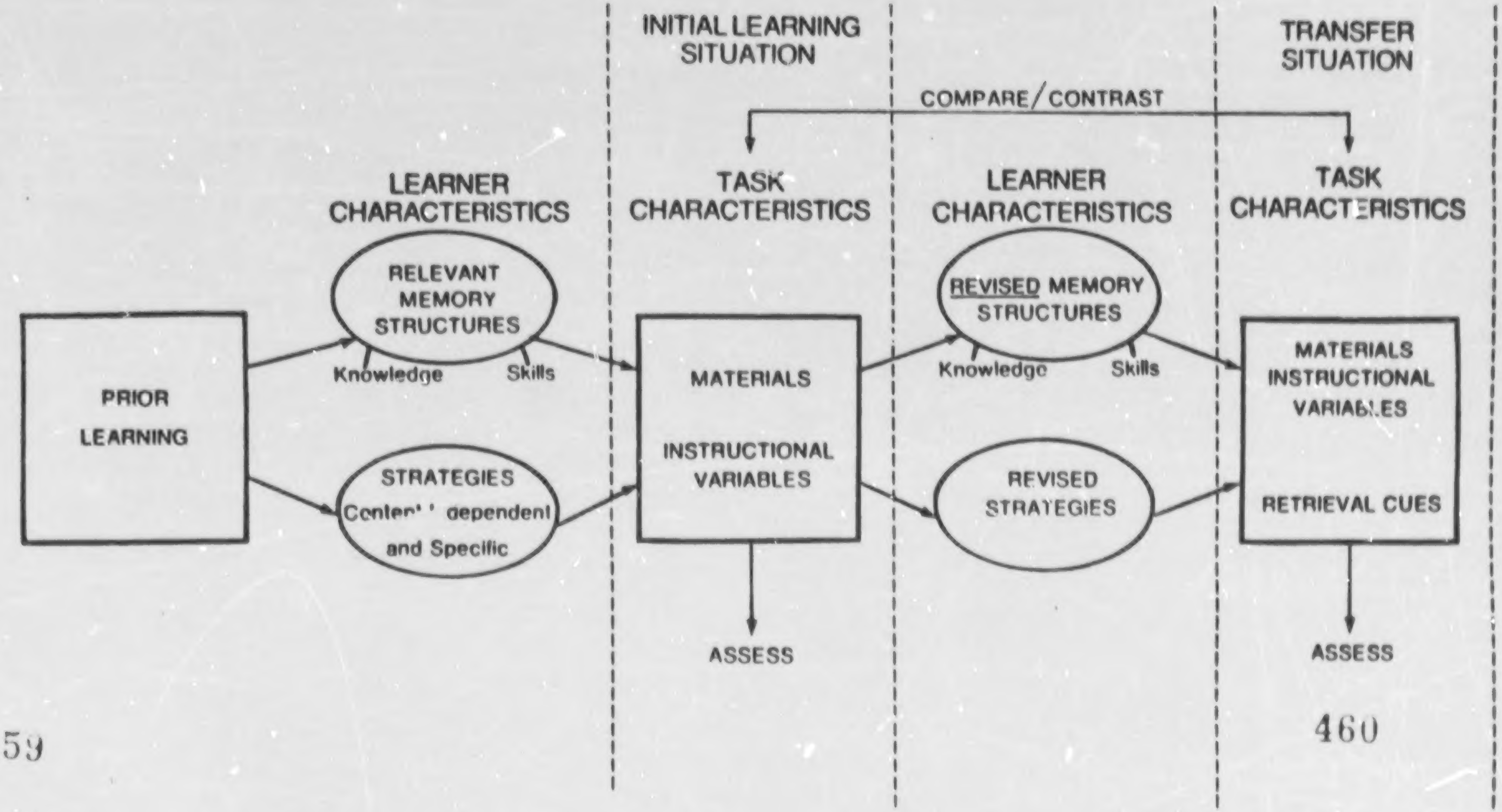
Figure 1. Transfer

Figure 2. Diagram illustrating interrelations and memory structures and performance outcomes.

Figure 3. Four types of transfer.

Figure 4. Hierarchy, chain, and cluster structures.

Figure 5. Summary map of a nursing textbook chapter.


INITIAL LEARNING SITUATION
TRANSFER SITUATION
COMPARE/CONTRAST
LEARNER CHARACTERISTICS
TASK CHARACTERISTICS
LEARNER CHARACTERISTICS
TASK CHARACTERISTICS
PRIOR LEARNING
RELEVANT MEMORY STRUCTURES
Knowledge
Skills
STRATEGIES Content dependent and Specific
MATERIALS
INSTRUCTIONAL VARIABLES
ASSESS
REVISED MEMORY STRUCTURES
Knowledge
Skills
REVISED STRATEGIES
MATERIALS INSTRUCTIONAL VARIABLES
RETRIEVAL CUES
ASSESS

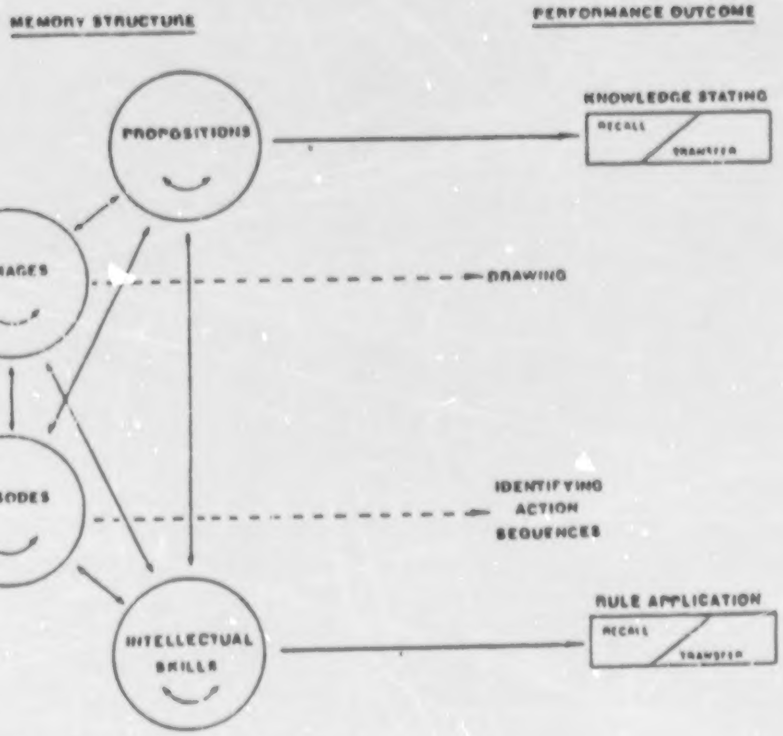

MEMORY STRUCTURE
PERFORMANCE OUTCOME
PROPOSITIONS
KNOWLEDGE STATING
RECALL
TRANSFER
IMAGES
DRAWING
EPISODES
IDENTIFYING ACTION SEQUENCES
INTELLECTUAL SKILLS
RULE APPLICATION
RECALL
TRANSFER

Figure #2 from Gagne, R. M. Memory structures and learning outcomes. Review of Educational Research, 1978, 48(2), 187-222. Reprinted by permission.

BEST COPY AVAILABLE

CONTENT TO CONTENT

(General Psych to Abnormal Psych)

SKILLS TO SKILLS

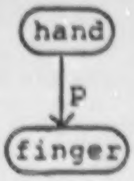
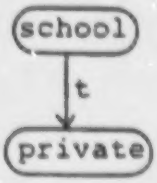
(Riding Bicycle to Driving Car)

CONTENT TO SKILLS

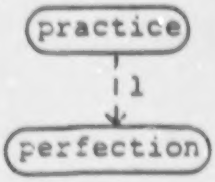
(Learning about Computers to Learning to Program)

SKILLS TO CONTENT

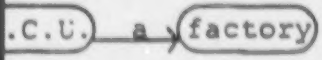
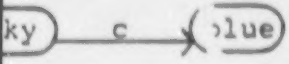
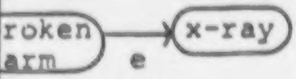
(Construction of Electronic Circuits to Electronic Theory)

Part (of) Link 	The content in a lower node is part of the object, process, idea or concept contained in a higher node.	Key Words is a part of is a segment of is a portion of
Type (of)/ Example (of) Link 	The content in a lower node is a member or example of the class or category of processes, ideas, concepts, or objects contained in a higher node.	Key Words is a type of is in the category is an example of is a kind of Three procedures are

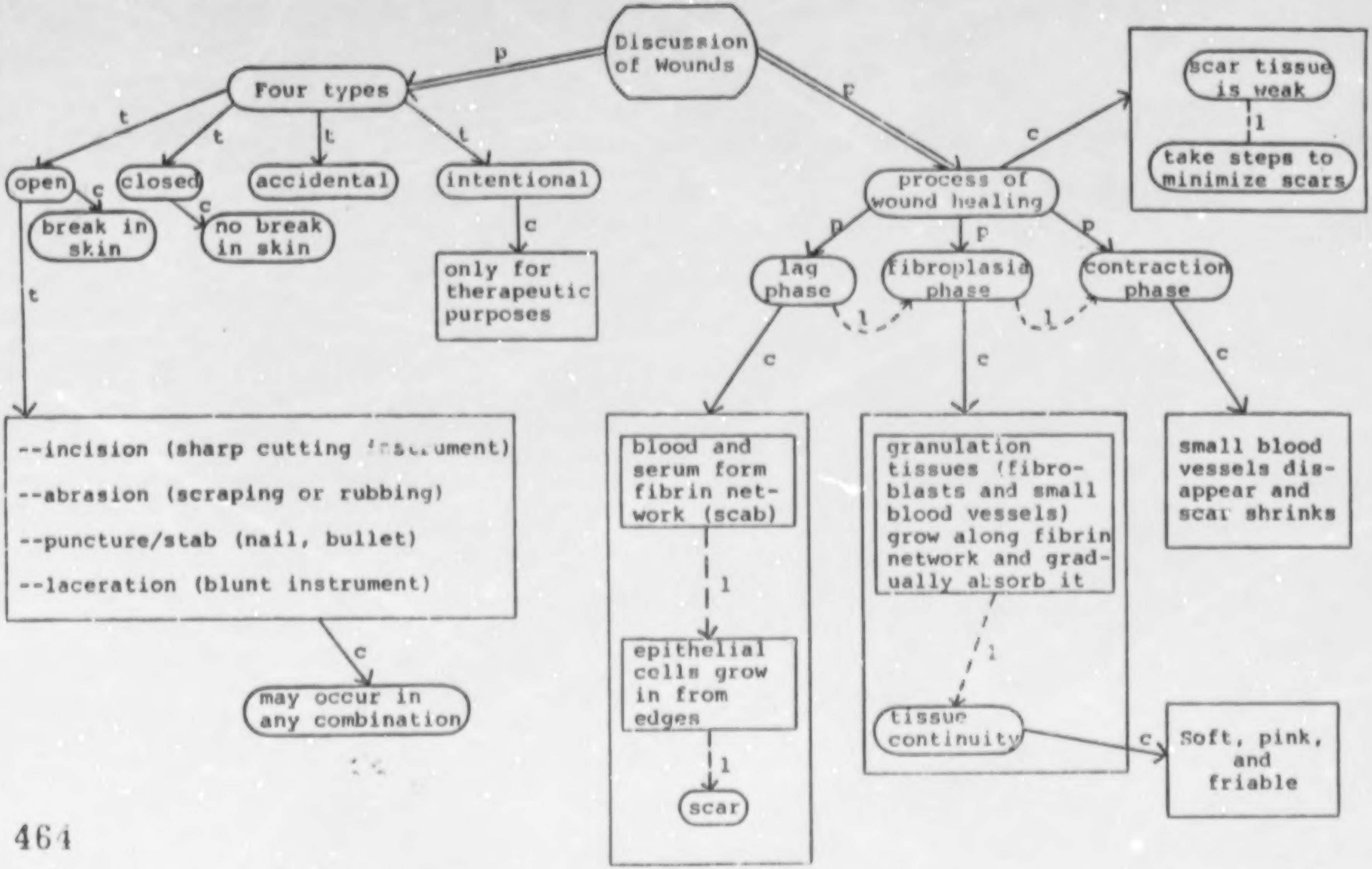
CHAIN STRUCTURES

Leads to Link 	The object, process, idea, or concept in one node leads to or results in the object, process, idea, or concept in another node.	Key Words leads to results in causes is a tool of produces

CLUSTER STRUCTURES

Analogy Link 	The object, idea, process, or concept in one node is analogous to, similar to, corresponds to, or is like the object, idea, process, or concept in another node.	Key Words is similar to is analogous to is like corresponds to
Characteristic Link 	The object, idea, process, or concept in one node is a trait, aspect, quality, feature, attribute, detail, or characteristic of the object, idea, process, or concept in another node.	Key Words has is characterized by feature is property is trait is aspect is attribute is
Evidence Link 	The object, idea, process, or concept in one node provides evidence, facts, data, support, proof, documentation, confirmation for the object, idea, process or concept in another node.	Key Words indicates illustrated by demonstrated by supports documents is proof of confirms

BEST COPY AVAILABLE


Discussion of Wounds
p
Four types
t
open
c
break in skin
closed
c
no break in skin
accidental
intentional
c
only for therapeutic purposes
t
--incision (sharp cutting instrument)
--abrasion (scraping or rubbing)
--puncture/stab (nail, bullet)
--laceration (blunt instrument)
c
may occur in any combination
p
process of wound healing
c
scar tissue is weak
l
take steps to minimize scars
p
lag phase
fibroplasia phase
contraction phase
l
c
blood and serum form fibrin network (scab)
epithelial cells grow in from edges
scar
granulation tissues (fibroblasts and small blood vessels) grow along fibrin network and gradually absorb it
tissue continuity
Soft, pink, and friable
small blood vessels disappear and scar shrinks

Reference Notes

1. Carroll, J. B. Learning from verbal discourse in educational media: A review of the literature. (ETSRB-71-61). Princeton, N. J.: Educational Testing Service, October 1971.

2. Fredrick, W. C. A comparison of verbal statement, symbolic notation, and figural representation of programmed structural grammar. Paper presented at the American Educational Research Association, Los Angeles, February 1969.

3. Brooks, L. W., & Dansereau, D. F. Knowledge schema training, field dependence, and descriptive prose processing. Manuscript submitted for publication, 1980.

4. Dapra, R. A., & Felker, D. B. Effects of comprehension and verbatim adjunct questions on problem-solving ability from prose material: Extension of the mathemagenic hypothesis. Paper presented at the Annual Convention of the American Psychological Association, New Orleans, 1974.

5. Snow, R. E., Shuell, T. J., & Marshalek, B. Individual differences in learning related processes: A prospectus. Unpublished manuscript, Stanford University, 1975.

6. Driver, M. Conceptual structure and group processes in an internotion simulation. Part one: The perception of simulated motions. Educational Testing Service Research Bulletin, RB62-15, 1962.

7. Saloman, G. Training for response uncertainty. Paper presented at the 76th Annual Convention of the American Psychological Association. San Francisco, 1968.

8. Witkin, H. A., Oltman, P. K., Cox, P. W., Ehrlichman E., Hamm, R. M., & Ringler, R. W. Field dependence-independence and psychological differentiation. Educational Testing Service Research Bulletin, RB-73-62, 1973.

9. Beller, E. K. Methods of language training and cognitive styles in lower class children. Paper presented at the meeting of the American Educational Research Association, New York, February, 1967.

10. Scott, N., & Sigel, I. E. Effects of inquiry training in physical science on creativity and cognitive styles of elementary school children. Research Report for United States Office of Education, 1965.

11. Witkin, H. A., Moore, C. A., Goodenough, D. R., & Cox, P. W. Field-dependent and field-independent cognitive styles and their educational implications. (Research Bulletin 75-24) Educational Testing Service, 1975.

12. Green, A. M., Green, E. E., & Walters, E. D. *Brain wave training, imagery, creativity and integrative experiences.* Paper presented at the first annual symposium on Biofeedback for Counseling, Education, and Psychotherapy, V. A. Hospital Topeka, Kansas, 1973.

13. Russell, D. G. *Location cues and the generation of movement.* Paper presented at the National Convention of the North American Society for the Psychology of Sport and Physical Activity, Anaheim, Calif., 1974.

14. McConkie, G. W., Rayner, K., & Mayer, B. J. *Manipulating reading strategies through pay-off conditions.* Unpublished manuscript, Cornell University, 1971.

15. Bauman, D. J., & Glass, G. V. *The effect on learning of the position of an organizer.* Paper presented at the meeting of the American Educational Research Association, Los Angeles, February, 1969.

16. Meichenbaum, D. H., & Turk, D. *The cognitive-behavioral management of anxiety, anger, and pain.* Paper presented at the Seventh Banff International Conference on Behavior Modification, Canada, May 1975.

References

Adams, J. A. A closed-loop theory of motor learning. *Journal of Motor Behavior*, 1971, *3*, 111-150.

Adams, H. E., & Vidulich, R. N. Dogmatism and belief congruence in paired-associate learning. *Psychological Reports*, 1962, *10*, 41-94.

Alabiso, F. Operant control of attention behavior: A treatment for hyperactivity. *Behavior Therapy*, 1975, *6*, 39-42.

Allen, M. S. *Morphological creativity*. Englewood Cliffs, N. J.: Prentice-Hall, 1962.

Allen, K. Some effects of advance organizers and levels of questions on the learning and retention of written social studies materials. *Journal of Educational Psychology*, 1970, 61(5), 333-339.

Anderson, J. R., & Bower, G. H. *Human associative memory*. Washington, D. C.: Winston, 1973.

Anderson, R. C. Control of student mediating processes during verbal learning and instruction. *Review of Educational Research*, 1970, *40(3)*, 349-369.

Anderson, R. C. & Biddle, W. B. On asking people questions about what they are reading. In G. Bower (Ed.), *Psychology of learning and motivation* (Vol. 9). New York: Academic Press, 1975.

Anderson, R. C., & Hidde, J. L. Imagery and sentence learning. *Journal of Educational Psychology*, 1971, *62*, 526-530.

Anderson, R. C. Pichert, J. W., Goetz, E. T., Schallert, D. L., Stevens, K. V., & Trollip, S. R. Instantiation of general terms. *Journal of Verbal Learning & Verbal Behavior*, *15*, 667-679, 1976.

Anderson, R. C., Reynolds, R. E., Schallert, D. L., & Goetz, E. T. Frameworks for comprehending discourse. *American Educational Research Journal*, 1977, *14*, 367-381.

Anderson, R. C., Spiro, R. J., & Anderson, M. C. *Schemata as scaffolding for the representation of information in connected discourse*. (Tech. Rep. 24) Urbana, Ill.: University of Illinois at Urbana-Champaign, Center for the Study of Reading, March 1977.

Anderson, T. H. Anderson, R. C. Dalgaard, B., Paden, D., Biddle, W., Surber, J., & Alessi, S. An experimental evaluation of a computer based study management system. *Educational Psychologist*, 1975, *11*, 184-190.

Andre, T. Does answering high-level questions while reading facilitate productive learning? Review of Educational Research, 1979, 49(2), 280-318. Copyright 1979, American Educational Research Association, Washington, D. C.

Atkin, J. M. Behavioral objectives in curriculum design: A cautionary note. The Science Teacher, 1968, 35, 27-30.

Ausubel, D. P. The psychology of meaningful verbal learning. New York: Grune & Stratton, 1963.

Ausubel, D. P. Educational psychology: A cognitive view. New York: Holt, Rinehart, & Winston, 1968.

Ausubel, D. P. In defense of advance organizers: A reply to the critics. Review of Educational Research, Spring, 1978, 48(2), 251-257.

Ausubel, D. P., & Fitzgerald, D. The role of discriminability in meaningful verbal learning and retention. Journal of Educational Psychology, 1961, 52, 266-274.

Ausubel, D. P., & Youssef, M. The effect of consolidation on sequentially related, sequentially independent meaningful learning. Journal of General Psychology, 1966, 74(2), 335-360.

Barnes, B. R., & Clawson, E. W. Do advance organizers facilitate learning? Recommendations for further research based on an analysis of 32 studies. Review of Educational Research, 1975, 45, 637-659.

Barrett, G. V., & Thornton, D. L. Cognitive style differences between engineers and college students. Perceptual and Motor Skills, 1967, 25, 789-793.

Barrett, G. V., & Thornton, C. L. Relationship between perceptual style and driver reaction to an emergency situation. Journal of Applied Psychology, 1968, 52, 169-176.

Bartlett, F. Thinking: An experimental and social study. London: Allen & Unwin, 1958.

Beighley, K. C. Experimental study of the effect of four speech variables on listener comprehension. Speech Monographs, 1952, 19, 249-258.

Belcastro, F.p.Relative effectiveness of the inductive and deductive methods of programming algebra. Journal of Experimental Education, Spring, 1966, 34(3), 77-82.

Benfari, R., & Vitale, P. Relationship between vertical orientation in the rod and frame test and in a compensatory tracking task. Perceptual and Motor Skills, 1965, 20, 1073-1080.

Berg, K. S. & Stone, G. L. Modeling and instructional effects as a function of conceptual level. *Canadian Journal of Behavioral Science/Revue canadienne des Sciences du comportement.* *10(2)*, 1978, 152-161.

Berry, G., Prather, D., & Jones, G. Effect of prompting and feedback on the learning of a perceptual skill. *Proceedings of the 79th Annual Convention of the American Psychological Association*, 1971, *6*, 589-590.

Bieri, J. Category width as a measure of discrimination. *Journal of Personality*, 1969, *37*, 513-521.

Biggs, J. B. Faculty patterns in study behavior. *Australian Journal of Psychology*, 1970, *22(2)*, 161-173. (a)

Biggs, J. B. Personality correlates of certain dimensions of study behavior. *Australian Journal of Psychology*, 1970, *22(3)*, 287-297. (b)

Bledsoe, J. C. Purser, J. D., & Frantz, N. R. Effects of manipulative activities on arithmetic achievement and retention. *Psychological Reports*, 1974, *35*, 247-252.

Bodden, J. L., Osterhouse, R., & Gelso, C. The value of a study skills inventory for feedback and criterion purposes in an educational skills course. *Journal of Educational Research*, 1972, *65(7)*, 309-311.

Bormuth, J. R. Readability: A new approach. *Reading Research Quarterly*, 1966, *1(3)*, 79-132.

Bourne, L. E., Jr. Factors affecting strategies used in problems of concept formation. *American Journal of Psychology*, 1963, *76*, 229-238.

Bower, G. H. How to ...uh...remember! *Psychology Today*, 1973, *7*, 62-67.

Bower, G. H. Cognitive psychology: An introduction. In W. K. Estes (Ed.), *Handbook of learning and cognitive processes* (Vol. 1). Hillsdale, N. J.: Erlbaum Associates, 1975.

Bower, G. H., & Reitman, J. S. Mnemonic elaboration in multilist learning. *Journal of Verbal Learning and Verbal Behavior*, 1972, *11*, 478-485.

Bransford, J. D., & Johnson, M. K. Considerations of some problems of comprehension. In W. G. Chase (Ed.), *Visual information processing*. New York: Academic Press, 1973, 383-438.

Briggs, R. D., Tosi, D. J., & Morley, R. M. Study habit modification and its effect on academic performances: A behavioral approach. *Journal of Educational Research*, 1971, *64(8)*, 347-350.

Brown, W. F., & Holtzman, W. H. Survey of study habits and attitudes. Form C. New York: The Psychological Corporation, 1966.

Brown, A. L., Smiley, S. S., Day, J. D., Townsend, M. A. R., & Lawton, S. C. Intrusion of a thematic idea in children's comprehension and retention of stories. Child Development, 1977, 47(2), 1454-1466.

Brown, W. F., Webe, N. D., Zunker, V. G., & Haslam, W. L. Effectiveness of student to student counseling on the academic adjustment of potential college dropouts. Journal of Educational Psychology, 1971, 62, 285-289.

Bruininks, R. H. Auditory and visual perceptual skills related to the reading performance of disadvantaged boys. Perceptual and Motor Skills, 1969, 29, 179-186.

Bruner, J. S. Toward a theory of instruction. Cambridge: Harvard University Press, 1966.

Bruner, J. S., Goodnow, J. J., & Austin, G. A. A study of thinking. New York: Wiley, 1956.

Butterfield, E. C., Belmont, J. M., & Peltzman, D. J. Effects of recall requirement on acquisition strategy. Journal of Experimental Psychology, 1971, 90(2), 347-348.

Caldwell, V. R., Schroder, D. B., Michael, W. B., & Meyers, C. E. Structure of intellect measures and other tests as predictors of success in tenth-grade geometry. Educational and Psychological Measurement, 1970, 30, 437-441.

Cermak, L. S. Rehearsal strategy as a function of recall expectation. Quarterly Journal of Experimental Psychology, 1972, 24, 378-385.

Claunch, N. C. Cognitive and motivation characteristics associated with concrete and abstract level of conceptual complexity. Joint ONR and NIMH Report, Princeton University, 1964.

Cody, M. An investigation of the relative effectivensss of four modes of presenting meaningful material to twelfth grade students. Doctoral dissertation, Fordham University, 1962, Ann Arbor, Mich.: University Microfilm, 1962, No. 62-3759.

Coleman, J. S., Campbell, E. Q., Hobson, C. J., McPartland, J., Mood, A. M., Weinfeld, F. D., & York, R. L. Equality of educational opportunity, Washington, D. C., United States Government Printing Office, 1966.

Collins, K. W., Dansereau, D. F., Holley, C. D., & McDonald, B. A. Control of concentration during academic tasks. Journal of Educational Psychology, 1981, 73(1), 122-128.

Covington, M. V., Crutchfield, R. S., Davis, L., & Olton, R. M. *The productive thinking program: A course in learning to think*. Columbus, Ohio: Merrill, 1974.

Crutchfield, R. S. Creative thinking in children: Its teaching and testing. In O. G. Brim, R. S. Crutchfield, & W. H. Holtzman (Eds.), *Intelligence: Perspectives, 1965*. New York: Harcourt Brace, Jovanovich, 1966.

Crutchfield, R. S., Woodworth, D. C., & Albrecht, R. E. *Perceptual performance and the effective person*. WADC-TN-58060, ASTIA Doc. No. AD 151-039, 1958.

Danner, F. W., & Taylor, A. M. Integrated pictures and relational imagery training in children's learning. *Journal of Experimental Child Psychology*, 1973, *16*, 47-54.

Dansereau, D. F. The development of a learning strategy curriculum. In H. F. O'Neil, Jr., (Ed.), *Learning strategies*. New York: Academic Press, 1978.

Dansereau, D. F., Actkinson, T. A., Long, G. L., & McDonald, B. A. *Learning strategies: A review and synthesis of the current literature* (AFHRL-TR-74-70, Contract F41609-74-C-0013). Lowry Air Force Base, Colorado: Air Force Human Resources Laboratory, 1974. (AD-07722)

Dansereau, D. F., Collins, K. W., McDonald, B. A., Garland, J. C., Holley, C. D., Evans, S. H., & Diekhoff, G. M. *Learning strategy training materials: A selected subset.* AFHRL-TR-78-64, Lowry Air Force Base, Colorado: Air Force Human Resources Laboratory, Technical Training Division, September, 1978. (AD-062739)

Dansereau, D. F., Collins, K. W., McDonald, B. A., Holley, C. D., Garland, J., Diekhoff, G. M., & Evans, S. H. Development and evaluation of an effective learning strategy program. *Journal of Educational Psychology*, 1979, *71(1)*, 64-73. (a)

Dansereau, D. F., Evans, S. H., Wright, A. D., Long, G. L., & Actkinson, T. A. *Factors related to developing instructional information sequences: Phase I.* (AFHRL-TR-63-51 (I)) Lowry Air Force Base, Colorado: Air Force Human Resources Laboratory, Technical Training Division, March, 1974. (NTIS NO. AD 777-832)

Dansereau, D. F., Long, G. L., Evans, S. H., & Actkinson, T. R. Objective ordering of instructional material using multidimensional scaling. *Journal of Structural Learning*, 1980(*6*), 299-314.

Dansereau, D. F., Long, G. L., McDonald, B. A., & Actkinson, T. R. *Learning strategy inventory development and assessment* (AFHRL-TR-75-40, Contract F41609-74-C-0013). Lowry Air Force Base, Colorado: Air Force Human Resources Laboratory, 1975.
(AD-A01472) (a)

Dansereau, D. F., Long, G. L., McDonald, B. A., Actkinson, T. R., Ellis, A. M., Co-lins, K. W., Williams, S., & Evans, S. H. *Effective learning strategy training program: Development and assessment* (AFHRL-TR-75-41, Contract F41609-74-0013). Lowry Air Force Base, Colorado: Air Force Human Resources Laboratory, 1975. (AD-A014722) (b)

Dansereau, D. F., Long, G. L., McDonald, B. A., Actkinson, T. R., Collins, K. W., Evans, S. H. Ellis, A. M., & Williams, S. *Learning strategy training program: Paraphrasing strategy for effective learning*. AFHRL-TR-75-46, Final Report, Contract F41609-74-C-0013, Air Force Systems Command, Brooks Air Force Base, Texas, June, 1975. (AD-A014-723) (c)

Dansereau, D. F., et al. *Learning strategy training program: Visual imagery for effective learning*, (AFHRL-TR-75-47, Final Report, Contract F41609-74-C-0013, Air Force Systems Command Brooks Air Force Base, Texas, June 1975. (AD-A014-724) (d)

Dansereau, D. F., et al. *Learning strategy training program: Questions and answers for effective learning*. AFHRL-TR-75-48, Final Report, Contract F41609-74-C-0013, Air Force Systems Command, Brooks Air Force Base, Texas, June 1975. (AD-A014-725) (e)

Dansereau, D. F., McDonald, B. A., Collins, K. W., Garland, J. C., Holley, C. D., Diekhoff, G., & Evans, S. H. Development and evaluation of a learning strategy system. In H. F. O'Neil, Jr. & C. D. Spielberger (Eds.), *Cognitive and affective learning strategies*. New York: Academic Press, 1979. (b)

Davis, G. A., Houtman, S. E., Warren, T. R., & Roweton, W. E. *A program for training creative thinking: I. Preliminary field test*. Wisconsin Research and Development Center for Cognitive Learning and the Department of Educational Psychology, University of Wisconsin, 1969.

Davis, W. L., & Phares, E. J. Internal-external control as determinants of information-seeking in a social influence situation. *Journal of Personality*, 1967, *35*, 547-561.

Dawson, D. T., &Ruddell, A. K. An experimental approach to the division idea. *The Arithmetic Teacher*, 1955, *2*, 6-9.

DeCaro, J. J. A hierarchy of skills as an organizational aid in a programmed instruction sequence with deaf persons. Doctoral dissertation, Syracuse University, 1977. *Dissertation Abstracts International* 38108A, p. 4674.

DelGiorno, W., Jenkins, J. R., & Bausell, R. B. Effects of recitation in the acquisition of prose. *Journal of Educational Research*, 1974, *67*, 293-294.

Dentler, R. A., & Mackler, B. Originality: Some social and personal determinants. *Behavioral Science*, 1964, *9*, 1-7.

DeRussy, E. A., & Futch, E. Field dependence-independence as related to college curricula. *Perceptual and Motor Skills*, 1971, *33*, 1235-1237.

DiVesta, F. J., Schultz, C. B., & Dangel, I. R. Passage organization and imposed learning strategies in comprehension and recall of connected discourse. *Memory and Cognition*, 1973, *1*, 471-476.

Doebler, L. K., & Eicke, F. J. Effects of teacher awareness of the educational implication of field-dependent/field-independent cognitive style on selected classroom variables. *Journal of Educational Psychology*, 1979, *71(2)*, 226-232.

Dubin, R., & Taveggia, T. C. *The teaching-learning paradox*. Eugene: University of Oregon Press, 1968.

Duncan, C. P. Descriptions of learning to learn in human subjects. *American Journal of Psychology*, 1960, *73*, 108-114.

Dunham, J. L., Guilford, J. P., & Hoepfner, R. Multivariate approaches to discovering the intellectual components of concept learning. *Psychological Review*, 1968, *75*, 206-221.

Dwyer, F. M., Jr. Adapting visual illustrations for effective learning. *Harvard Educational Review*, 1967, *37*, 250-263.

Eagle, M., Goldberger, L., & Breitman, M. Field dependence and memory for social vs. neutral and relevant vs. irrelevant incidental stimuli. *Perceptual and Motor Skills*, 1969, *29*, 903-910.

Egan, D. E., & Greeno, J. G. Acquiring cognitive structure by discovery and rule learning. *Journal of Educational Psychology*, 1973, *64*, 85-97.

Eisner, E. W. Educational objectives. Help or hindrance. *School Review*, 1967, *75*, 251-282.

Ellis, A. *Reason and emotion in psychotherapy*. New York: Lyle Stuart, 1963.

Ernst, G. W., & Hewell, A. *GPS: A case study in generality and problem solving*. New York: Academic Press, 1969.

Estes, W. K. The state of the field: General problems and issues of theory and metatheory. In W. K. Estes (Ed.), *Handbook of learning and cognitive processes* (Vol. 1). Hillsdale, New Jersey: Erlbaum Associates, 1975.

Fennema, E. H. The relative effectiveness of a symbolic and a concrete model in learning a selected mathematical principle. *Journal for Research in Mathematics Education*, 1972, *3*, 233-238.

Ferrell, J. F. *The differential performance of lower class, preschool, Negro children as a function of the sex of E, sex of S, reinforcement condition, and level of field dependence*. Doctoral dissertation, University of Southern Mississippi, 1971. Dissertation Abstracts International, 1971, 32, 3028B-3929B. (University Microfilms 71-28, 831.)

Fitts, P. M., & Posner, M. I. *Human performance*. Belmont, California: Brooks/Cole, 1967.

Frase, L. T. Effect of question location, pacing, and mode upon retention of prose material. *Journal of Educational Psychology*, 1968, *59*, 224-248.

Frase, L. T. Paragraph organization of written materials: The influence of conceptual clustering upon level and organization of recall. *Journal of Educational Psychology*, 1969, *60*, 394-401.

Frase, L. T. Integration of written text. *Journal of Educational Psychology*. 1973, *65*, 252-261.

Gagne, R. M. *Curriculum research and promotion of learning*. Perspectives of curriculum education. AERA Monograph Series on Curriculum Education: Monograph No. 1. Chicago: Rand McNally, 1967.

Gagne, R. M. Domains of learning. *Interchange*, 1972, *3*, 1-8.

Gagne, R. M. The learning basis of teaching methods. In N. L. Gage (Ed.), *The psychology of teaching methods*. Seventy-fifth Yearbook, National Society for the Study of Education, Part I. Chicago: Chicago University Press, 1976.

Gagne, R. M., & White, R. T. Memory structures and learning outcomes. *Review of Educational Research*, 1978, *48(2)*, 187-222. Copyright, 1978, American Educational Research Association, Washington, D.C.

Gardner, R. W. Cognitive styles in categorizing behavior. *Journal of Personality*, 1953, *22*, 214-233.

Gay, L. R. *Temporal position of reviews and its effect on the retention of mathematical rules*. Tallahasee: Florida State University Computer-Assisted Instruction Center (Contract N00014-68-A-1494), Personnel and Training Research Program, Office of Naval Research, April 1971. (AD 279-055)

Gerlach, V. S., Schultz, R. E., Baker, R. L., & Mazer, G. E. Effects of variations in directions on originality test response. *Journal of Educational Psychology*, 1964, *55*, 79-83.

Ghiselin, B. *The creative process*. Berkeley, California: University of California Press, 1952.

Glaser, R. Objectives and evaluation: An individualized system. *Science Education News*. American Association for the Advancement of Science, 1967, 1-3.

Goldman, R., & Warren, R. Discriminant analysis of study strategies connected with college grade success in different major fields. *Journal of Educational Measurement*, 1973, *10*, 39-47.

Grieve, T. D., & Davis, J. K. The relationship of cognitive style and method of instruction to performance in ninth grade geography. *Journal of Educational Research*, 1971, *65*, 137-141.

Groninger, L. D. Mnemonic imagery and forgetting. *Psychonomic Science*, 1971, *23(2)*, 161-163.

Guilford, J. P., & Hoepfner, R. *The analysis of intelligence*. New York: McGraw-Hill, 1971.

Guilford, J. P., Hoepfner, R., & Peterson, H. Prediction of achievement in ninth-grade mathematics from measures of aptitude factors. *Educational and Psychological Measurement*, 1965, *25*, 659-682.

Guthrie, J. T. Instruction versus a discovery method. *Journal of Educational Psychology*, 1967, *58*, 45-49.

Hartley, J., & Davies, L. K. Preinstructional strategies: The role of pretests, behavioral objectives, overviews, and advance organizers. *Review of Educational Research*, 1976, *46*, 239-265.

Hartnett, R. T. *Learning style preferences among college students*. College Entrance Examination Board Research and Development Reports, RB-73-14, 1973.

Haslam, W. L., & Brown, W. G. Effectiveness of study skills instruction for high school sophomores. *Journal of Educational Psychology*, 1968, *59*, 223-226.

Hersch, P. D., Scheibe, K. G. Reliability and validity of internal-external control as a personality dimension. *Journal of Consulting Psychology*, 1967, *31*, 609-613.

Hester, F. M., & Tagatz, G. B. The effects of cognitive style and instructional strategy on concept attainment. *Journal of General Psychology*, 1971, *85*, 229-237.

Hills, J. R. Factor analyzed abilities and success in college mathematics. *Educational and Psychological Measurement*, 1957, *17*, 615-622.

Holding, D. F. *Principles of training*. New York: Pergamon, 1965.

Holley, C. D., Dansereau, D. F., McDonald, B. A., Garland, J. C., & Collins, K. W. Evaluation of a hierarchical mapping technique as an aid to prose processing. *Contemporary Educational Psychology*, 1979, *4*, 227-237.

Houston, J. P. Verbal transfer and interlist similarities. *Psychological Review*, 1964, *71*, 412-414.

Houston, J. P. Transfer as a function of the similarity between first-list stimuli and second-list responses. *Journal of Verbal Learning and Verbal Behavior*, 1966, *5*, 322-323

Hunt, E. We know who knows, but why? In R. C. Anderson, R. J. Spiro, and W. E. Montague (Eds.), *Schooling and the acquisition of knowledge*, Hillsdale, New Jersey: Erlbaum & Associates, 1977.

Hyman, R. On prior information and creativity. *Psychological Reports*, 1961, *9*, 151-161.

Jacobsen, E. *Progressive relaxation*. Chicago: University of Chicago Press, 1938.

Jacoby, L. L. Test appropriate strategies in retention of categorized lists. *Journal of Verbal Learning and Verbal Behavior*, 1973, *12*, 675-685.

James, N. E. Personal preference for method as a factor in learning. *Journal of Educational Psychology*, 1962, *53*, 43-47.

Johnson, D. M., Parrott, G. L., & Stratton, R. P. Production and judgment of solutions to five problems. *Journal of Educational Psychology*, 1968, *59*, (Monograph Supplement No. 6).

Julian, J. W., & Katz, S. B. Internal control and the value of reinforcement. *Journal of Personality and Social Psychology*, 1968, *8*, 89-94.

Johnson, R. E. Abstract processes in the remembering of prose. *Journal of Educational Psychology*, 1974, *66*, 772-779.

Kagan, J., Moss, H. A., & Sigel, I. G. The psychological significance of styles of conceptualization. In J. F. Wright and J. Kagans (Eds.), *Basic Cognitive Processes in Children*. Monograph of the Society for Research in Child Development, 1963, 28, 73-112.

Kagan, J., Rosman, B., Day, D., Albert, J., & Phillips, W. Information processing in the Child: Significance of analytic and reflective attitudes. Psychological Monographs, 1964, 78, (1, Whole No. 578).

Katona, G. Organizing and memorizing. New York: Columbia University Press, 1940.

Kennedy, R. S. The relationship of field independence, extraversion, and neuroticism to success in naval aviation training. Appendix A. Unpublished doctoral dissertation, University of Rochester, 1972.

Keogh, B. K., & Donlon, G. McG. Field dependence, impulsivity, and learning disabilities. Journal of Learning Disabilities, 1972, 5, 16-21.

King, D. J. Retention of connected meaningful material as a function of mode of presentation and recall. Journal of Experimental Psychology, 1968, 77, 676-683.

King, D. J., & Madill, J. Complex methods of presentation, internal consistency of learning material, and accuracy of written recall. Psychological Reports, 1968, 22, 777-782.

Kintsch, W., Kosminsky, E., Streby, W. J., McKoon, G., & Keenan, J. M. Comprehension and recall of text as a function of content variables. Journal of Verbal Learning and Verbal Behavior, 1975, 14, 196-214.

Klare, G. R. The measurement of readability. Ames, Iowa: Iowa State University Press, 1963.

Klausmeier, H. J., & Meinke, D. L. Concept attainment as a function of instructions concerning the stimulus material, a strategy, and a principle for securing information. Journal of Educational Psychology, 1968, 59, 215-222

Kleck, R. E., & Wheaton, J. Dogmatism and responses to opinion-consistent and opinion-inconsistent information. Journal of Personality and Social Psychology, 1967, 5(2), 249-252.

Koestler, A. The act of creation. New York: Macmillan, 1964.

Konstadt, N., & Forman, E. Field dependence and external directedness. Journal of Personality and Social Psychology, 1965, 1, 490-493.

Lave, J. Tailor-made experiments and evaluating the intellectual consequences of apprenticeship training. In Hall & Cole, Child Development, 1977, 1, 1-3.

Lawton, J. P., & Wanska, J. K. Advance organizers as a teaching strategy: A reply to Barnes & Clawson. Review of Educational Research, 1977, 47, 233-244.

Lee, L. C., Kagan, J., & Rabson, A. The influence of a preference for analytic categorization upon concept acquisition. Child Development, 1963, 34, 433-442.

Levine, J. R., & Divine-Hawkins, P. Visual imagery as a prose learning process. Journal of Reading Behavior, 1974, 6, 23-30.

Long, G. L. The development and assessment of a cognitive process based learning strategy training program. Unpublished doctoral dissertation. Texas Christian University, 1976.

Lordahl, D. S. Concept identification using simultaneous auditory and visual signals. Journal of Experimental Psychology, 1961, 62, 283-290.

Lowry, D. H. The effects of mnemonic learning strategies on transfer, interference, and 48-hour retention. Journal of Experimental Psychology, 1974, 103(1), 16-20.

Macrae, A. W., & Holding, D. H. Rate and force of guidance in perceptual-motor tasks with reversed or random spatial correspondence. Ergonomics, 1966, 9, 289-296.

Mager, R. F. Deriving objectives for the high school curriculum. National Society Programmed Instructional Journal, 1968, 7, 7-14.

Maier, N. R. F. Reasoning in humans. I. On direction. Journal of Comparative Psychology, 1930, 10, 115-143.

Mansfield, R. S., Busse, T. V., & Krepelka, E. J. The effectiveness of creativity training. Review of Educational Research, 1978, 48(4), 517-536.

Marteniuk, R. G. Information processing in motor skills. Holt, Rinehart, & Winston, New York, 1976.

Maultsby, M. Handbook of rational self-coaching. Madison, Wisconsin: Association for Rational Thinking, 1971.

Mayer, R. E. Acquisition processes and resilience under varying testing conditions of structurally different problem solving procedures. Journal of Educational Psychology, 1974, 66, 644-656.

Mayer, R. E. Forward transfer of different reading strategies evoked by testlike events in mathematics text. Journal of Educational Psychology, 1975, 67(2), 165-169.

Mayer, R. E. Information processing variables in learning to solve problems. Review of Educational Research, 1975, 45, 525-541.

Mayer, R. E. Some conditions of meaningful learning for computer programming: Advance organizers and subject control of frame order. Journal of Educational Psychology, 1976, 68(2). 143-150.

Mayer, R. E. Advance organizers that compensate for the organization of text. Journal of Educational Psychology, December, 1978, 70(6), 880-886.

Mayer, R. E. Qualitatively different encoding strategies for linear reasoning premises: Evidence for single association and distance theories. Journal of Experimental Psychology: Human Learning and Memory, January, 1979, 5(1), 1-10.

Mayer, R. E., & Greeno, J. P. Structural differences between learning outcomes produced by different instructional methods. Journal of Educational Psychology, 1972, 63, 165-173.

Mayer, R. E., Stiehl, C. C., & Greeno, J. P. Acquisition of understanding and skill in relation to subjects' preparation and meaningfulness of instruction. Journal of Educational Psychology, 1975, 67, 331-350.

McConkie, G. W., & Meyer, B. J. Investigation of reading strategies: II. A replication of pay-off condition effects. Journal of Reading Behavior, 1974, 6, 151-158.

McConkie, G. W., & Rayner, K. Investigation of reading strategies: I. Manipulating strategies through pay-off conditions. Journal of Reading Behavior, 1974, 6, 9-18.

McConkie, G. W., Rayner, K., & Wilson, J. S. Experimental manipulation of reading strategies. Journal of Educational Psychology, 1973, 65(1), 1-8.

McLeod, D. B., & Adams, V. M. The interaction of field independence with discovery learning in mathematics. Journal of Experimental Education, Fall, 1979, 48, 32-35.

Meadow A., Parnes, S. J., & Reese, H. Influence of brainstorming instructions and problem sequence on a creative problem solving test. Journal of Applied Psychology, 1959, 43, 413-416.

Meichenbaum, D. H., & Goodman, J. Training impulsive children to talk to themselves: A means of self-control. Journal of Abnormal Psychology, 1971, 77, 115-126.

Melton, R. F. Resolution of conflicting claims concerning the effect of behavioral objectives on student learning. *Review of Educational Research*, Spring 1978, *48(2)*, 291-302.

Messick, S., & Damarin, F. Cognitive style and memory for faces. *Journal of Abnormal and Social Psychology*, 1964, *69*, 313-317.

Meyer, B. J. F. *The organization of prose and its effects on memory*. Amsterdam: North-Holland Publishing Co., 1975.

Minsky, M. A framework for representing knowledge. In P. H. Winston (Ed.), *The psychology of computer vision*. New York: McGraw-Hill, 1975.

Miyake, N., & Norman, D. A. To ask a question, one must know enough to know what is not known. *Journal of Verbal Learning and Verbal Behavior*, 1979, *18*, 357-364.

Montague, W. E., & Carter, J. F. Vividness of imagery in recalling connected discourse. *Journal of Educational Psychology*, 1973, *64*, 72-75.

Mowbray, G. H. Simultaneous vision and audition: The comprehension of prose passages with varying levels of difficulty. *Journal of Experimental Psychology*, 1953, *46*, 365-372.

Munro, A., & Rigney, J. W. *A schema theory account of some cognitive processes in complex learning*. (Tech. Rep. 81) Los Angeles: University of Southern California, Department of Psychology, July 1977.

Norman, D. A. Memory, knowledge, and the answering of questions. In R. L. Solso (Ed.), *Contemporary issues in cognitive psychology*. The Loyola symposium. Washington, D. C.: V. H. Winston & Sons, 1973, 135-166.

Nelson, D. L., & Archer, C. S. The first letter mnemonic. *Journal of Educational Psychology*, 1972, *63(5)*, 482-486.

Newell, A., Simon, H. A., & Shaw, J. D. Elements of a theory of human problem solving. *Psychological Review*, 1958, *65*, 151-166.

Newell, A., Simon, N. A., & Shaw, J. C. *Report on a general problem solving problem*. Proceedings of International Conference on Information Processing. Paris: UNESCO, 1960, 256-264.

Olton, R. M., & Crutchfield, R. S. Developing the skills of productive thinking. In P. Mussen, J., Langer, & M. Covington (Eds.), *Trends and issues in developmental psychology*. New York: Holt, Rinehart, & Winsson, 1969.

Osborn, A. F. *Applied imagination*. New York: Scribners, 1953.

Osgood, C. E. The similarity paradox in human learning: A resolution. *Psychological Review*, 1949, *56*, 132-143.

Owens, J., Dafoe, J., & Bower, G. Taking a point of view: Character identification and attributional processes in story comprehension and memory. *Memory and Cognition*, 1979, in press.

Paivo, A. *Imagery and verbal processes*. New York: Holt, Rinehart, & Winston, 1971.

Parasnis, I., & Long, G. L. Relationships among spatial skills, communication skills, and field independence in deaf students. *Perceptual and Motor Skills*, 1979, *49*, 879-887.

Passy, R. A. The effect of cuisenaire materials on reasoning and computation. *The Arithmetic Teacher*, 1963, *10*, 439-440.

Patterson, C. J., & Mischel, W. Plans to resist distraction. *Developmental Psychology*, 1975, *11(3)*, 369-378.

Pettigrew, T. F. The measurement and correlates of category width as a personality variable. *Journal of Personality*, 1958, *26*, 532-544.

Phares, E. J. Differential utilization of information as a function of internal-external control. *Journal of Personality*, 1968, *36*, 649-662.

Polya, G. *How to solve it*. Garden City, New York: Doubleday Anchor, 1957.

Postman, L. Transfer, interference and forgetting. In J. W. Kling & L. A. Riggs (Eds.), *Woodworth & Schlosberg's Experimental Psychology*. Holt, Rinehart, & Winston, Inc., 1971.

Pylyshyn, Z. W. What the mind's eye tells the mind's brain: A critique of mental imagery. *Psychological Bulletin*, 1973, 80, 1-24.

Rasco, R. W., Tennyson, R. P., & Boutwell, R. C. Imagery instructions and drawings in learning prose. *Journal of Educational Research*, 1975, *67(2)*, 188-192.

Raths, J. Teaching without specific objectives. *Educational Leadership*, 1971, *28*, 714-720.

Renzi, N. B. A study of some effects of field ndependence-independence and feedback on performance achievement. Doctoral dissertation, Hofstra University, 1974. *Dissertation Abstracts International*, 1974, *35*. 2059A. (University Microfilms No. 74-21, 861).

Rickards, J. P. Adjunct postquestions in text: A critical review of methods and processes. *Review of Educational Research*, 1979, *49(2)*, 181-196.

Rickards, J. P., & Denner, P. R. Inserted questions as aids to reading text. *Instructional Science*, 1978, *7*, 313-346.

Rickards, J. P., & DiVesta, F. J. Type and frequency of questions in processing textual material. *Journal of Educational Psychology*, 1974, *68*, 354-362.

Rickards, V. P., & Hatcher, C. W. Interspersed meaningful learning questions as semantic cues for poor comprehenders. *Reading Research Quarterly*, 1978, *13*, 538-553.

Ritter, K., Kaprove, B. H., Fitch, J. P., & Flavell, J. H. The development of retrieval strategies in young children. *Cognitive Psychology*, 1973, *5*, 310-321.

Robinson, F. P. *Effective study*. New York: Harper, 1946.

Rokeach, M. *The open and closed mind*. New York: Basic Books, 1960.

Rosenthal, T. L., Moore, W. B., Dorfman, H., & Nelson, B. Vicarious acquisition of a simple concept with experimenter as model. *Behavior Research and Therapy*, 1971, *9*, 219-227.

Rothkopf, E. Z. Some theoretical and experimental approaches to problems in instruction. In J. D. Krumbolz (Ed.), *Learning and the Educational Process*, 193-221. Chicago: McNally, 1965.

Rothkopf, E. Z. Learning from written instructive materials: An exploration of the control of inspection behavior by test-like events. *American Educational Research Journal*, 1966, *3(4)*, 241-249.

Rothkopf, E. Z., & Bisbicos, E. E. Selective facilitative effects of interspersed questions in learning from written materials. *Journal of Educational Psychology*, 1967, *58*, 56-61.

Rotter, J. B. Generalized expectancies for internal versus external control of reinforcement. *Psychological Monographs*, 1966, *89(1)*, (00, Whole No. 609).

Royer, J. M. Theories of the transfer of learning. *Educational Psychologist*, 1979, *14*, 53-69.

Royer, J. M., & Cable, G. W. Illustrations, analogies, and facilitative transfer in prose learning. *Journal of Educational Psychology*, 1976, *68*, 205-209.

Rumelhart, D. E. Notes on a schema for stories. In D. G. Bobrow & A.M. Collins (Eds.), *Representation and understanding: Studies in cognitive science.* New York: Academic Press, 1975.

Rumelhart, D. E., Lindsay, P. H., & Norman, D. A. A process model for long-term memory. In E. Tulving & W. Donaldson (Eds.), *Organization of memory*. New York: Academic Press, 1972.

Rumelhart, D. E., & Ortony, A. The representation of knowledge in memory. In R. C. Anderson, R. J. Spiro, & W. E. Montague (Eds.), *Schooling and the acquisition of knowledge*. Hillsdale, New Jersey: Erlbaum, 1977.

Sanders, N. M., & Tzeng, O. The relationship between rote and conceptual learning. In F. J. DiVesta, N. M. Sanders, C. B. Schultz, & P. B. Weener, *Instructional strategies: Multi-variable studies of psychological processes related to instruction*. ARPA Semi-Annual Rep., 1971.

Santa, J. C., Ruskin, A. B., & Yio, J. H. Mnemonic systems in free recall. *Psychological Reports*, 1973, *32*, 1163-1170.

Scandura, J., & Wells, J. Advance organizers in learning abstract mathematics. *American Educational Research Journal*, 1967, *4*, 295-301.

Schallert, D. L. Improving memory for prose: The relationship between depth of processing and context. *Journal of Verbal Learning and Verbal Behavior*, 1976, *15*, 621-632.

Schank, R., & Abelson, R. P. Scripts, plans, and knowledge. *Proceedings of the Fourth International Joint Conference on Artificial Intelligence*. Tbilisi, Georgia: U.S.S.R., 1975.

Schmeidler, G. K. Visual imagery correlated to a measure of creativity. *Journal of Consulting Psychology*, 1965, *29(1)*, 78-80.

Schroder, H., Driver, M., & Streufert, S. *Human information processing*. Holt, Rinehart, & Winston: New York, 1967.

Schultz, R. W., & Kasschau, R. A. Serial learning as a function of meaningfulness and mode of presentation with audio and visual stimuli and equivalent duration. *Journal of Experimental Psychology*, 1966, *71(3)*, 350-354.

Seeman, M., & Evans, J. W. Alienation and learning in a hospital setting. *American Sociological Review*, 1962, *27*, 772-783.

Shavelson, R. J., Berliner, D. C., Ravitch, M. M., & Loeding, D. Effects of position and type of question on learning from prose material: Interaction of treatments with individual differences. *Journal of Educational Psychology*, 1974, *66*, 40-48.

Sieber, J. E., & Lanzetta, J. T. Some determinants of individual differences in predecision information processing behavior. Journal of Personality, 1966, 4, 561-571.

Siegel, L., & Siegel, L. C. Educational set: A determinant of acquisition. Journal of Educational Psychology, 1965, 56, 1-12.

Sigel, I. E. Sigel cognitive style test. Detroit: Merrill Palmer Institute, 1967.

Singer, R. N. To err or not to err: A question for the instruction of psychomotor skills. Review of Educational Research, 1977, 47(3), 479-498.

Singer, R. N. Motor skills and learner strategies. In H. F. O'Neil, Jr. (Ed.), Learning strategies. New York: Academic Press, 1978.

Singer, R. N., & Gaines, L. Effect of prompted and trial-and-error learning on transfer performance of a serial motor task. American Educational Research Journal, 1975, 12, 395-403.

Singer, R. N., & Pease, D. The effect of different instructional strategies on learning, retention, and transfer of a serial motor task. Research Quarterly, 1976, 47, 788-796.

Skinner, B. F. An operant analysis of problem solving. In B. Kleinmuntz (Ed.), Problem solving: Research, method, and theory. New York: Wiley, 1966, 225-257.

Snow, R. E. Individual differences, instructional theory, and instructional design. (Tech. Rep. No 4) Aptitude Research Project, School of Education, Stanford University (ARPA Contract No. N00014-75-C-0882) June, 1977.

Sonstroem, A. M. On the conservation of solids. In J. S. Bruner, R. R. Olver, & P. M. Greenfield (Eds.), Studies in cognitive growth. New York: Wiley, 1966.

Spilich, G. J., Vesonder, G. T., Chiesi, H. L., & Voss, J. F. Text processing of domain-related information for individuals with high and low domain knowledge. Journal of Verbal Learning and Verbal Behavior, 1979, 18, 275-290.

Steffenson, M. S., Jogdeo, C., & Anderson, R. C. A cross-cultural perspective on reading comprehension (Tech. Rep. 97). Champaign Illinois: University of Illinois, Center for the Study of Reading, July, 1978.

Stevenson, H. W., & Siegel, A. Effects of instruction and age on retention of filmed content. Journal of Educational Psychology, 1969, 60, 71-74.

Sticht, T. G., & Zapf, D. W. Reading and readability in the armed services. Alexandria, Virginia: Human Resources Research Organization, September, 1976. HumRRo FR-WD-CA-76-4.

Stratton, R. P., & Brown, R. Improving creative thinking by training in the production and/or judgment of solutions. Journal of Educational Psychology, 1972, 63(4), 390-397.

Streufert, S., Clardy, M., Driver, M., Karlins, M., Schroder, H., & Suedfeld, P. A tactical game for the analysis of complex decision making in individuals and groups. Psychological Reports, 1965, 17, 723-729.

Stromnes, F. J., & Nyman, J. Immediate and long-term retention of connected concrete discourse as a function of mnemonic picture-type sequence and context. Scandinavian Journal of Psychology, 1974, 15, 197-202.

Stuart, I. R. Perceptual style and reading ability: Implications for an instructional approach. Perceptual and Motor Skills, 1967, 24, 130-138.

Suedfeld, P., & Hagen, R. L. Measurement of information complexity: I. Conceptual structure and information pattern as factors in information processing. Journal of Personality and Social Psychology, 1966, 4, 233-236.

Sulin, R. A., & Dooling, D. J. Intrusion of a thematic idea in retention of prose. Journal of Experimental Psychology, 1974, 103, 255-262.

Taylor, W. L. Cloze procedure: A new tool for measuring readability. Journalism Quarterly, 1953, 30, 415-433.

Thorndyke, P. W. Cognitive structures in comprehension and memory of narrative discourse. Cognitive Psychology, 1977, 9, 77-110.

Thornton, C. C., Barrett, G. V., & Davis, J. A. Field dependence and target identification. Human Factors, 1968, 10, 493-496.

Torrance, E. P. Role of evaluation in creative thinking. Bureau of Educational Research, University of Minnesota, 1964.

Trollip, S. R. The evaluation of a complex computer-based flight procedures trainer. Human Factors, 1979, 21(1), 47-54.

Trueblood, C. R. A comparison of two techniques for using visual-tactual devices to teach exponents and nondecimal bases in elementary school mathematics. The Arithmetic Teacher, 1970, 17, 338-340.

Tulving, E. Episodic and semantic memory. In E. Tulving and W. Donaldson (Eds.), *Organization of Memory*. New York: Academic Press, 1972.

Valverde, H. H. A. A review of flight simulator transfer of training studies. *Human Factors*, 1973, *15*, 510-523.

Van Dijk, T. A., & Kintsch, W. Cognitive psychology and discourse. In W. Dressler (Ed.), *Current trends in textlinguistics*. Berlin, W. Germany: deGruyter, 1977.

Van Mondfrans, A. P. & Travers, R. Learning of redundant material presented through two sensory modalities. *Perceptual and Motor Skills*, 1964, *19(3)*, 743-751.

VanZoost, F. L., & Jackson, B. T. Effects of self-monitoring and self-administered reinforcement on study behaviors. *Journal of Educational Research*, 1974, *67(5)*, 216-218.

Voss, J. F. Cognition and instruction: Toward a cognitive theory of learning. In A. M. Lesgold, J. W. Pellegrino, S. D. Fokkema, & R. Glaser (Eds.), *Cognitive psychology and instruction*. New York: Plenum Press, 1978.

Wallach, M. A. & Caron, A. J. Attribute criteriality and sex-linked conservatism as determinants of psychological similarity. *Journal of Abnormal and Social Psychology*, 1959, *59*, 43-50.

Wanshura, P. B., & Borkowski, J. G. Development and transfer of mediational strategies by retarded children in pair-associated learning. *American Journal of Mental Deficiency*, 1974, *78*, 631-639.

Warren, T. F., & Davis, G. A. Techniques for creative thinking: An empirical comparison of three methods. *Psychological Reports*, 1969, *25*, 207-214.

Watts, G. H., & Anderson, R. C. Effects of three types of inserted questions on learning from prose. *Journal of Educational Psychology*, 1971, *62*, 387-394.

Weinstein, C. E. *Learning of elaboration strategies*. Unpublished doctoral dissertation, University of Texas at Austin, 1975.

Weinstein, C. E. Elaboration skills as a learning strategy. In H. F. O'Neil, Jr. (Ed.), *Learning strategies*. New York: Academic Press, 1978.

Weisskopf-Joelson, E., & Eliseo, T. S. An experimental study of the effectiveness of brainstorming. *Journal of Applied Psychology*, 1961, *45*, 45-49.

Whitehill, R. P. The development of effective learning skills programs. Journal of Educational Research, 1972, 65(6), 281-285.

Winograd, T. Understanding natural language. New York: Academic Press, 1972.

Witkin, H. A. Embedded figures test. Consulting Psychologists Press, Inc.: California, 1971.

Witkin, H. A., Dyk, R. B., Faterson, H. F., Goodenough, D. R., & Karp, S. A. Psychological differentiation: Studies of development. New York: Wiley, 1962.

Witkin, H. A., Goodenough, D. R., & Karp, S. A. Stability of cognitive style from childhood to young adulthood. Journal of Personality and Social Psychology, 1967, 7, 291-300.

Witkin, H. A., Lewis, H. B., Hertzman, M., Machover, K., Meissner, P. B., & Wapner, S. Personality through perception. New York: Harper, 1954.

Witkin, H. A., Lewis, H. B., & Weil, E. Affective reactions and patient-therapist interactions among more differentiated and less differentiated patients early in therapy. The Journal of Nervous and Mental Disease, 1968, 146, 193-208.

Wittrock, M. C. The cognitive movement in instruction. Educational Psychologist, 1979,

Wittrock, M. C., & Carter, J. Generative processing of hierarchically organized words. American Journal of Psychology, 1975, 88, 489-501.

Wolpe, J. The practice of behavioral therapy. New York: Pergamon, 1969.

Yuille, J., & Catchpole, M. Effects of delay and imagery training on the recall and recognition of object pairs. Journal of Experimental Child Psychology, 1974, 17, 474-481.

Zimmerman, B. J., & Rosenthal, T. L. Observational learning of rule-governed behavior by children. Psychological Bulletin, 1974, 81, 24-42.

APPENDICES

TABLE OF CONTENTS:

VOLUME II

TABLE OF CONTENTS

VOLUME II

TABLE OF CONTENTS i

PREFACE iii

INTRODUCTION: A CONCEPTUAL FRAMEWORK FOR FOUNDATIONS, Ann H. Areson and James J. DeCaro 1

SECTION

I. TEACHER ROLES AND INSTRUCTIONAL STRATEGIES

Chapter

Primary Mentoring as a Teaching Strategy, Roger Hawkins . . 59

Tutoring Special Students, Russell T. Osguthorpe 107

Summary of Competency-Based Education, Mastery Learning and Individualization and Their Implications for the Foundations Program, Eugene A. Nelson 145

II. OTHER CRITICAL CONSIDERATIONS

The Theory of Experiential Learning, Richard J. Kraft . . . 201

Experiential Learning as a Teaching Strategy for the Career Education of Hearing-Impaired College Students, Urban Whitaker 269

Multicultural Coping and Adaptation Competencies, Jacqueline Howell Wasilewski and Janice D. Martin Mitchell. 355

APPENDICES

A. TABLE OF CONTENTS: VOLUME I 366

B. ABOUT THE AUTHORS: VOLUME II 370

ABOUT THE AUTHORS:

VOLUME I

ANN H. ARESON currently is on leave from the National Technical Institute for the Deaf (NTID) at Rochester Institute of Technology (RIT) to devote full time to her doctoral studies. She has worked and studied in the fields of cross-cultural communication and non-formal education.

IRENE ATHEY is professor and dean of the Graduate School of Education at Rutgers University. She has written extensively in the areas of child development and the psychology of reading, with particular emphasis on the development of language and cognition as they affect the growth of reading comprehension both in the hearing and the hearing impaired.

MARY FIELD BELENKY has conducted numerous studies investigating moral development with Lawrence Kohlberg and Carol Gilligan. She directed the Education for Women's Development Project, which sought to understand how institutions might promote epistemological and moral development in adult and adolescent women. She is now co-authoring a book titled The Small Still Voice: The Development of Women's Ways of Knowing.

ROWLAND S. BLAKE is an instructional developer and has developed textbooks, videotapes, and other instructional materials for deaf and hearing adults. His research studies center around instructional strategy variables. He is currently developing computer-based, interactive video materials for Digital Equipment Corporation.

LARRY W. BROOKS recently received his Ph.D. in experimental Psychology from Texas Christian University, and is currently employed by the U.S. Army Research Institute. His research interests include text processing, learning strategies, and individual differences in cognitive processing.

DONALD F. DANSEREAU is a professor of psychology at Texas Christian University. His current research is focused on the examination of cognitive strategies for processing written text.

JAMES J. DE CARO is currently Associate Professor and Director of the Division of Career Opportunities at the National Technical Institute for the Deaf at Rochester Institute of Technology where he has responsibility for the National Center on Employment of the Deaf, the National Project on Career Education, Admissions, Placement, the Alumni Office, and the Career Opportunities Research Unit. His current research interests include the economic accommodation of deaf people in society.

FRED DOWALIBY received his B.A.(1969), M.S.(1971), and Ph.D.(1973) in Psychology from the University of Massachusetts at Amherst. Dr. Dowaliby was Assistant Director, Department of Research and Development at the National Board of Medical Examiners, Philadelphia before coming to NTID in 1977. Since that time he has been involved with various projects and activities related to classroom instruction, the research area in which he is most interested. He is currently focusing on several large-scale studies which are concerned with individual differences and instructional outcomes from various methods of instruction for the hearing impaired.

JO ANNE PAGANO is assistant professor of education at Colgate University where she teaches courses in curriculum and the philosophy of education. She has published articles in curriculum theory and philosophy of education.

MICHAEL STEVE is an assistant professor at NTID and has conducted research in the areas of concept and rule learning and problem solving. Prior to joining NTID, he designed and developed a forty-hour critical thinking and problem solving course and authored parts of "Computeronics", a set of modules which introduces the computer as a problem solving tool. Both have been disseminated nationally and are in use in elementary, junior high schools and high schools.

MICHAEL STINSON is currently a Research Associate and Assistant Professor at the National Technical Institute for the Deaf in the Department of Educational Research and Development. He received his Ph.D. in Educational Psychology from the University of Michigan in 1972. Before coming to NTID he held post-doctoral research positions at the Bureau of Child Research Laboratory, University of Kansas Medical Center and at the Center on Deafness at the University of California, San Francisco. His major research interests are language comprehension by hearing-impaired persons and the relationship between social motivation and deafness. He has published and presented a number of papers on these topics. He has been a consulting editor for the Journal of Speech and Hearing Disorders.